1999

# Airport to University West-East Corridor Study Salt Lake City, Utah Final Environmental Impact Statement

U.S. Department of Transportation Federal Transit Administration and the Utah Transit Authority

**AIRPORT TO UNIVERSITY WEST-EAST CORRIDOR STUDY**
**SALT LAKE CITY, UTAH**

**FINAL ENVIRONMENTAL IMPACT STATEMENT**

**U.S. DEPARTMENT OF TRANSPORTATION**
**FEDERAL TRANSIT ADMINISTRATION**
**and the**
**UTAH TRANSIT AUTHORITY**

**SUBMITTED PURSUANT TO:**

National Environmental Policy Act of 1969, §102, 41 U.S.C. §4332(2)(C); National Historic Preservation Act of 1996, §106, 16 U.S.C. §470f; Executive Order 11990 (Protection of Wetlands); 49 U.S.C. 5301(e), 5323(b), and 5324(b); Title 49 U.S.C. §303 formerly Department of Transportation Act of 1966, §4(f); and E.O. 12898, "Environmental Justice for Low Income and Minority Populations."

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JOHN INGLISH — DATE
GENERAL MANAGER
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These signatures authorize the release of this document for public availability.

**Final Environmental Impact Statement**
**(FEIS)**

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| | |
|---|---|
| Lead Federal Agency: | U.S. Department of Transportation<br>Federal Transit Administration |
| Lead Local Agency: | Utah Transit Authority |
| Assisting Local Agency: | Wasatch Front Regional Council |

***Title of Proposed Action***

Airport to University West-East Corridor Study

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# ABSTRACT

Based upon coordination with public and government agencies, combined with evaluation of technical considerations, the Wasatch Front Regional Council has identified a Light Rail Transit (LRT) system as the preferred alternative to serve the Airport to University Transportation Corridor of Salt Lake City, Utah. The 10.9 mile west-east corridor will be constructed from the Salt Lake City International Airport, through the Central Business District (CBD) to the University of Utah Health Sciences Center. It will interface with the existing north-south LRT line at 400 South and Main Street, and at South Temple and 400 West. The West-East LRT project will fulfill the following objectives: improve transit reliability between major destinations within the corridor; reduce traffic congestion; improve air quality; interface with the existing and planned regional transit system; assure minimal impacts on the natural and manmade environment; support development of a multi-modal transportation system that is convenient, accessible, and flexible enough to increase capacity; and connect with service extended to new areas in the future.

This document describes the environmental impacts associated with the construction and operation of the West-East LRT, and a No-Build alternative. The purpose of analyzing a No-Build alternative is to provide a baseline for comparison of alternatives, as well as to determine the effect of taking no action. The No-Build alternative includes all existing transportation improvements as well as all planned and committed transportation projects listed in the State Transportation Improvement Plan. The environmental, transportation and financial impacts of the two alternatives are evaluated and compared against a wide range of considerations including: land use, visual and aesthetic impacts, historic and cultural impacts, parks and open spaces, socioeconomic and demographic, public safety and security, environmental justice, wetlands, ecosystems, water and air quality, floodplains, potential contaminant sources noise and vibration, minerals, utilities, mobility, cost effectiveness, and transportation systems.

Some impacts to the natural and manmade environment will occur. These impacts, along with mitigation measures to reduce anticipated impacts are detailed in this document.

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# ACRONYMS

| | |
|---|---|
| ACOE | Army Corps of Engineers |
| ADA | Americans with Disabilities Act |
| ADT | Average Daily Traffic |
| ANSI | American National Standards Institute |
| APCD | Air Pollution Control Division |
| AQCC | Air Quality Control Commission |
| ARUP | Association of Regional and University Pathologists |
| BFC | Brooks Fiber Communications |
| BMP | Best Management Practice |
| BRT | Bus Rapid Transit |
| BTU | British Thermal Unit |
| CBD | Central Business District |
| CERCLA | Comprehensive Environmental Response Compensation & Liability Act |
| CERCLIS | Comprehensive Environmental Response Compensation & Liability Information System |
| CERL | Construction Engineering Research Laboratory |
| CFR | Code of Federal Regulations |
| cfs | cubic feet per second |
| CMA | Congestion Mitigation and Air Quality |
| CO | carbon monoxide |
| COE | Corps of Engineers |
| CWP | Clean Water Plan |
| DAQ | Division of Air Quality |
| dB | decibel |
| dBA | A weighted decibels |
| DEIS | Draft Environmental Impact Statement |
| DERR | Utah Division of Environmental Response and Remediation |
| EIS | Environmental Impact Statement |
| EL | Electric Lightwave |
| EPA | Environmental Protection Agency |
| ERNS | Emergency Response Notification System |
| ESA | Environmental Site Assessment |
| FAA | Federal Aviation Administration |
| FEIS | Final Environmental Impact Statement |
| FEMA | Federal Emergency Management Agency |
| FFGA | Full Funding Grant Agreement |
| FHWA | Federal Highway Administration |
| FINDS | Facility Index System |
| FRN | Federal Register Notice |
| FTA | Federal Transit Administration |
| FGT | Fixed Guideway Transit |
| FY | fiscal year |
| GRAMA | Government Records Access and Management Act |
| HC | hydrocarbon |
| HCM | Highway Capacity Manual |
| HOV | High-Occupancy Vehicle |

| | |
|---|---|
| HPMS | Highway Performance Monitoring System |
| HVAC | Heating Ventilation Air Conditioning |
| ISSR | Inland Sea Shorebird Reserve |
| ITE | Institute of Transportation Engineers |
| ITS | Intelligent Transportation Systems |
| LDS | Latter-day Saints |
| $L_{eq}$ | Noise level fluctuating over a given periods of time |
| $L_{dn}$ | Noise level averaged over a 24-hour period |
| LOS | Level of Service |
| LPA | Locally Preferred Alternative |
| LRT | Light-Rail Transit |
| LRTP | Long-Range Transportation Plan |
| LRV | light-rail vehicle |
| LUST | Leaking Underground Storage Tank |
| m | microns |
| MINUTP | traffic analysis modeling program |
| MIS | Major Investment Study |
| MPO | Metropolitan Planning Organization |
| NAAQS | National Ambient Air Quality Standards |
| NAC | Noise Abatement Criteria |
| NEPA | National Environmental Protection Act |
| NFPA | National Fire Protection Association |
| $NO_x$ | nitrogen oxides |
| NPL | National Priority List |
| NRHP | National Register of Historic Places |
| NWI | National Wetland Inventory |
| $O_3$ | ozone |
| O&M | Operations and Maintenance |
| OSHA | Occupational Safety and Health Administration |
| PADS | PCB Activity Database System |
| PAHs | polycyclic aromatic hydrocarbons |
| Pb | lead |
| PCB | Polychlorinated Biphenyl |
| PM | Particulate matter |
| $PM_{10}$ | Particulate matter under 10 microns in size |
| POTW | publicly-owned treatment works |
| PPM | Parts per Million |
| QI | Questar Infocomm |
| RACM | reasonably available control measures |
| RAQC | Regional Air Quality Council |
| RCRA | Resource Conservation and Recovery Act |
| RMS | Root Mean Square |
| ROD | Record of Decision |
| ROW | right-of-way |
| RTD | Regional Transportation District |
| SARA | Superfund Amenities and Reauthorization Act |
| SB | Senate Bill |
| SHPO | State Historic Preservation Office |

| | |
|---|---|
| SLC | Salt Lake City |
| SLCIA | Salt Lake City International Airport |
| SIP | State Implementation Plan |
| STIP | Statewide Transportation Improvement Plan |
| $SO_2$ | sulfur dioxide |
| SOV | single-occupancy vehicle |
| SP | Southern Pacific Railroad |
| TAC | Technical Advisory Committee |
| TAZ | traffic analysis zones |
| TDM | transportation demand management |
| TEA | Transportation Equity Act |
| TIP | Transportation Improvement Plan |
| TOD | Transit Oriented Development |
| TRAX | Transit Express |
| TRIS | Toxic Chemical Release Inventory System |
| TSM | transportation system management |
| TSS | total suspended solids |
| USDA | United States Department of Agriculture |
| UDOT | Utah Department of Transportation |
| UDWR | Utah Division of Wildlife Resources |
| UMTA | Urban Mass Transportation Administration |
| UP | Union Pacific |
| UP&L | Utah Power & Light |
| UPDES | Utah Pollutant Discharge Elimination System |
| USDOT | United States Department of Transportation |
| USEPA | United States Environmental Protection Agency |
| USGS | United States Geological Survey |
| UST | underground storage tanks |
| USFWS | U.S. Fish and Wildlife Service |
| UTA | Utah Transit Authority |
| UZA | Urban Zone Area |
| VA | Veterans Administration |
| v/c | volume to capacity ratio |
| VdB | Vibrational velocity decibel |
| VMT | vehicle miles traveled |
| VOCs | volatile organic compounds |
| WFRC | Wasatch Front Regional Council |
| WQCD | Water Quality Control Division |
| WVC | West Valley City |

# EXECUTIVE SUMMARY

According to the National Environmental Policy Act (NEPA) of 1969, any action undertaken by federal agencies that may have significant impacts on the human or natural environment must be preceded by the preparation of an Environmental Impact Statement (EIS). The Wasatch Front Regional Council (WFRC) and the Utah Transit Authority (UTA) are local lead agencies for the West-East Airport to University Light Rail Transit (LRT) Project, and are responsible for preparing the environmental documentation required by NEPA. This Final EIS (FEIS) must be submitted to the Federal Transit Administration (FTA) as the sponsoring federal agency for approval.

A Major Investment Study/Draft Environmental Impact Statement (MIS/DEIS) for this project was released for public review and comment in August, 1997. This MIS/DEIS identified Alternative C, Light Rail Transit (LRT) with Transportation Systems Management (TSM) and Traffic Demand Management (TDM) as the Locally Preferred Alternative (LPA) to be studied in detail in the FEIS. The MIS/DEIS process also provided a forum for public involvement by soliciting comments on the impacts and proposed mitigation measures for the LPA.

The LRT Alternative which was selected in the MIS/DEIS process as the LPA consists of an LRT transit system that would operate along the 10.9 mile West-East Corridor, extending from the Salt Lake City International Airport (SLCIA) on the west, through downtown Salt Lake City, to the Health Sciences Center at the University of Utah on the east. The system includes 16 stations, one of which is designated as a future station, and a maintenance and storage facility located near SLCIA on a parcel of land south of North Temple and west of 2400 West.

The purpose of preparing this FEIS is to compare the environmental and transportation impacts of the LPA with a No-Build Alternative (where no action is followed other than existing programmed projects and maintenance of existing transportation facilities). This comparison illustrates the level of impact anticipated from the project. This FEIS also presents mitigation measures that could reduce or eliminate the level of impact associated with the project. The information in this document provides the technical information necessary for public agencies, affected communities, and the public to evaluate and compare the consequences of these two alternatives.

This Executive Summary highlights the most significant findings of the EIS under the following headings:

- Purpose and Need
- Alternatives Considered, Including Proposed Action
- Affected Environment
- Transportation Impacts and Mitigation
- Environmental Consequences
- Financial Analysis and Evaluation
- Public Involvement and Agency Coordination

## PURPOSE AND NEED

The Salt Lake City area will reach a population of over 1.357 million by the year 2020. Employment is forecasted to rise to 698,549 by 2020 from 474,096 in 1998. Within the West-East Corridor itself, population is expected to grow from roughly 50,000 in 1990 to 72,372 in 2020. Non-agricultural/ non-construction employment in the corridor is expected to increase from 130,000 jobs in 1990 to over 200,000 jobs in 2020. During the 1995 to 2020 time period, within the West-East Corridor, residential growth is projected to increase roughly 25.4 percent, retail growth 36.5 percent, and nonagriculture/nonconstruction employment 40 percent.

With the increase in population, employment growth, and associated economic development, the regional transportation network will become more congested. Travel in the Salt Lake area is projected to grow significantly over the next 22 years. Total trips will grow by 67 percent by 2020 and vehicle miles traveled (VMT) will increase by 71 percent. Total travel to or from the West-East Corridor is expected to grow by 28 percent. The area wide increase of growth in total trips and VMT is greater than the area wide increase in residential, commercial and industrial growth. This is due in part to the following factors:

- Dispersed, single-family development is the most common land use pattern in the area;
- In recent years, daily auto trips have increased from an average of about two and a half to more than four per person;
- An increase in car ownership per household, from 1.89 in 1993 to 1.98 in 2020;
- An increasing drive-alone rate. Between 1980 and 1990 the drive-alone rate for work trips increased from 67 percent to 76 percent.

Traffic congestion is projected to grow faster than either VMT or population. It is anticipated that recurring peak-period delays will result in more than $60 million in lost hours per year on the freeways and arterial roadways as peak-period speeds drop to an average of about 15 miles per hour. Congestion on north-south streets providing access to the West-East Corridor will increase significantly by 2020. Within the corridor, traffic and parking impacts on neighborhoods are a community concern.

A unique feature of the West-East Corridor that contributes to high levels of transit and travel demand is the existence of a large number of special trip generators throughout the length of the corridor. These special generators include facilities such as the following:

- LDS Church Downtown Campus
- Utah State Fairpark
- Delta Center
- Salt Lake Arts Center
- Abravanel Hall
- Salt Palace Convention Center
- Capitol Theater
- John W. Gallivan Utah Center
- Hansen Planetarium

- Fine Arts Museum/Museum of Natural History at the University of Utah
- Pioneer Memorial Theater
- Kingsbury Hall
- Rice-Eccles Stadium
- John M. Huntsman Center

Today, all of the special generators in the corridor generate over 14 million person trips per year. A high percentage of these trips occur within the corridor moving to and from the various activities and to hotels/motels within the corridor. Because these trips are fairly short and frequent, they are capable of attracting a large percentage of transit trips that avoid travel and parking in congested areas.

In February of 2002, Salt Lake City will host the Winter Olympic Games. Major Olympic facilities and 47 percent of the Olympic lodging are located in the West-East Corridor, as well as SLCIA, where athletes, coaches, Olympic staff and spectators will likely arrive and depart. It is expected that approximately 1.6 million tickets for the Winter Olympic Games will be available, not to mention the anticipated trips generated by the increased media, commercial and service activity.

## ALTERNATIVES CONSIDERED

**Screening and Selection Processes of the Major Investment Study/Draft EIS**
In March 1996, WFRC began screening and selection of alternatives for the West-East Corridor. Alternatives were screened with the objective of improving mobility in the corridor and reducing congestion, while ensuring that environmental and social factors were considered as well. A wide range of conceptual alternatives and alignment options was considered, and is described in greater detail in the MIS/DEIS. Ultimately, the wide range of possible technologies and strategies was narrowed in the MIS/DEIS process to three groups:

- Improved Bus Service/High Occupancy Vehicle lanes (HOV) with transportation system management (TSM) and travel demand management (TDM);

- LRT, combined with TSM and TDM;

- A No-Build Alternative.

Design concepts for each of the groups were further refined by screening alternative alignments for western, eastern, and downtown portions of the study area. Alignments were screened based on travel time, capital, and operations/maintenance costs, mobility improvements, access, neighborhood impacts, redevelopment potential, intersection level of service, parking and access preservation, population and employment within walking distance of stations, ease of transfer, environmental impacts, compatibility with land use plans, and compatibility with bus and north-south LRT operations. Ultimately, one alternative from each group above was studied in the DEIS phase.

During the DEIS process, alternatives were evaluated based on transportation impacts, environmental impacts and benefits, and costs. The LRT Alternative (with TSM and TDM) was selected as the Locally Preferred Alternative since it would do more than either the No-Build or HOV/Bus Alternatives to: (1) benefit the environment; (2) promote land use policies and plans; (3)

be cost effective in the long view; (4) provide the greatest mobility; and (5) assure the greatest operating efficiencies.

**Further Alternative Refinement in the FEIS**
In this FEIS phase of the project, the Locally Preferred Alternative (LRT Alternative with TSM and TDM) was analyzed in greater detail, and compared with the No-Build Alternative. The alternatives studied in the FEIS are as follows:

**No-Build Alternative:** This alternative is the "no-build" alternative required by NEPA. The No-Build Alternative is defined as "no-build" because it represents the condition and status of the transportation system in the West-East Corridor for the year 2020 if no major investment is made to improve or change what currently exists or is already planned and committed. Existing arterial street traffic lanes and intersection geometry are assumed to be maintained. The following improvements are included:

1. I-15 Reconstruction. This project is reconstructing I-15 from 600 North to 10800 South. Besides its additional capacity, other substantial changes from pre-construction conditions will be:
   - Separate HOV lanes to and from the south starting at 400 South, and an HOV-only 400 South interchange to and from the south;
   - A new interchange for mixed-use traffic to access 400 South to and from the north;
   - Shortening of ramp viaducts into and leaving downtown to support the Gateway District Redevelopment.

2. North-South Light Rail Transit (LRT);

3. UTA Bus Routes Coordinated with the North-South LRT;

4. Intelligent Transportation System (ITS);

5. Downtown Railroad Consolidation;

6. Gateway Land Use Master Plan;

7. A new SLCIA terminal as per the recently adopted Airport Master Plan.

**LRT Alternative:** This West-East Light Rail Transit facility is illustrated in Figure 1.2-1, and includes the following. The alignment for this LRT line will begin at the Salt Lake City International Airport (SLCIA). From the airport terminal, it will pass through what are now parking lots, then follow the I-80/SLCIA access road to about 2500 West, then turn north for about a block to North Temple Street. The planned maintenance facility will be located in this area near 2500 West. The line continues eastward down the center of North Temple to the west side of downtown Salt Lake City. At 400 West, the LRT line turns south in the center of 400 West to 400 South. The LRT alignment turns east at 400 South and splits into two separate tracks on opposite sides of the street. Eastbound trains run along the south side of the street and westbound trains run along the north side of the street. At the

200 East intersection, the tracks transition back to the center of 400 South and continue east to about 1000 East. At that location, the LRT line follows the roadway up a steep hill remaining in the middle of the street, as the street turns and becomes 500 South. East of 1300 East, near Rice-Eccles Stadium, the LRT alignment turns north for one block (along the west edge of the stadium parking lot) to South Campus Drive. It then turns east and passes through the University of Utah campus on the north side of South Campus Drive. The LRT line then turns left to follow Wasatch Boulevard in an alignment that is located on the east side of the street. The LRT line continues north on the east side of Medical Drive to the terminus at the University of Utah Health Sciences Center.

The LRT line includes 15 stations, including two terminal stations at the west and east ends, and one future station, as illustrated in Figure 1.3-2. Park and Ride lots would be located on the south side of North Temple across from the Utah State Fairpark and in the vicinity of 500 South and Guardsman Way near the University of Utah. The LRT Alternative would include a TSM and TDM component as described in greater detail in Section 2.3.3. In addition, the LRT Alternative would include all the improvements assumed above under the No-Build Alternative.

## TRANSPORTATION IMPACTS AND MITIGATION

A detailed discussion of the analysis and evaluation of transportation impacts and mitigation is presented in Section 4 of this FEIS. A brief summary of that analysis is presented below. Details of the LRT alignment and station locations are also presented in Section 4.

The LRT system will operate with trains every 10 minutes during peak periods and every 20 minutes during off-peak periods. The system will include 15 LRT stations initially, with one additional designated future station. Park and Ride stations will be located at the State Fairpark and in the vicinity of the University of Utah. Analysis of future transit ridership produced a forecast of 16,761 daily boardings for the West-East LRT system by the year 2020, including ridership estimated for special generators.

Implementation of LRT in the West-East Corridor will have a positive effect on transit travel times. This was measured by comparing transit travel times between various origin and destination locations within the WFRC study area. A comparison of the transit travel times is presented in Table ES-1.

**Table ES-1**
**Total Transit Travel Time Comparison (minutes - peak times)**

| From | To | 2020 No-Build | 2020 LRT-Build |
|---|---|---|---|
| South Salt Lake | Airport | 83 | 58 |
| West Valley City | Airport | 83 | 60 |
| Sandy | Airport | 137 | 110 |
| West Jordan | Airport | 105 | 86 |

These and other comparisons of total transit travel times are presented in Section 4.2.1. It is important to point out that the LRT station for transit at the airport is within 300 feet walking distance of the airport terminal. LRT passengers will therefore have a relatively short walk from the end of the LRT line compared to either longer walks or a shuttle ride for those using outlying parking.

A unique feature of the West-East Corridor is the large number of facilities that function as special trip generators that were identified earlier in this Executive Summary. Today, these special generators attract over 14 million people per year. Because the WFRC transportation planning models focus primarily on home-based trips, a large portion of these special generator trips are not accounted for in the transit ridership projections. A conservative estimate of potential transit ridership from special generators showed 4,820 passengers for the No-Build Alternative and 14,459 passengers for the LRT-Build Alternative.

With the No-Build Alternative, it is assumed that there would be only limited improvements in bus service throughout the corridor and study area. Since buses are affected by increasing street congestion resulting in slower speeds, transit travel times under the No-Build Alternative will become longer. In contrast, LRT operating in its own dedicated right-of-way (ROW) or traffic lane will be able to avoid increasing traffic congestion. This makes transit a more attractive alternative with the LRT Alternative. Annual transit ridership within the WFRC study area is forecast by the year 2020 to be higher by 4,021,626 more passengers for the LRT Alternative than would be experienced with the No-Build Alternative, including those forecast for special generators. A more complete summary of future total daily and annual transit passengers for the two alternatives is presented in Section 4.2.2.

UTA is currently undertaking a major planning process to modify bus routes in relation to starting operation of the North-South LRT line scheduled for the spring of the year 2000. Most of these routes will remain when the West-East LRT is implemented. The following basic modifications will be made to local and regional bus routes:

- Some local bus routes between downtown and the University of Utah or the airport will be replaced by LRT transit service;
- Shuttle bus service connecting with LRT stations will be extended to the International Center on the west and to the Research Park/Hogle Zoo/State Park area on the east;
- Regional express bus routes that serve downtown along the West-East Corridor will be diverted to LRT stations near the ends of the corridor.

Selected LRT stations will be designed as expanded transit center locations where autos and buses can interface with the LRT, as well as provide an opportunity for people to transfer between bus routes serving each station. Two of these transit center stations will be located in the vicinity of North Temple at the State Fairpark and near 500 South and Guardsman Way adjacent to the University of Utah. Parking will be available in the vicinity of these locations.

Most of the alignment for the West-East LRT line is located in the center of existing arterial streets along North Temple, 400 West, and 400 South. The exception is along 400 South between 400 West and 200 East where one direction of the LRT track will be on each side of the street with an 85-foot clear zone in the middle for regular traffic. Considerable planning and analysis has been undertaken to optimize the operation of LRT combined with normal street traffic along the West-East Corridor. The details of this analysis are presented in Section 4.

Eventually, it is anticipated that all on-street parking will need to be removed in order to provide adequate traffic capacity. Analysis was undertaken to determine how best to mitigate the loss of on-street parking. For much of the corridor, an ample supply of off-street parking is available. Along the streets where the LRT alignment is located, there are 118 metered stalls and 553 non-metered stalls. On side streets adjacent to the alignment, there are 272 metered stalls and 1,299 non-metered stalls. Field occupancy checks determined that the noon peak appears to be the busiest time period. Even during this busy time period, over 60 percent of the available parking stalls are vacant. It was further determined that if parking is totally removed from the streets along the alignment and relocated to the side streets, only about half of the side street parking stalls would be occupied during peak periods. Between 400 West and 1300 East along 400 South and 500 South, it is estimated that 517 on-street parking spaces will be eliminated in an area where there are 4,875 off-street parking spaces are available.

Side running LRT on 400 South between 400 West and 200 East will impact access to adjacent property. In this area, there are 50 points of access to adjacent property that will be affected. Each of these access points has been identified along with a preliminary assessment of the mitigation requirements and opportunities. The details of this analysis are summarized in Table 4.4-2 of the FEIS.

Detailed traffic flow and capacity analysis has been undertaken for both the No-Build and the LRT Alternatives. This analysis, and the conclusions resulting therefrom, are presented in Section 4.3.3 of the FEIS. Because of significant increases in traffic volumes by the year 2020, and also because of new connections from 400 South to I-15, the level of service (LOS) at most intersections throughout the corridor is expected to significantly deteriorate with the No-Build Alternative. Construction and operation of LRT has the following fundamental impacts:

- The amount of traffic moving in the corridor is reduced by as much as 5 percent due to trips being diverted from auto to transit;
- Some of the street capacity that would be available under the No-Build Altèrnative will be required to construct the LRT Alternative;
- The presence of LRT requires a dedicated left turn signal phase (no permissive or "yield" left turns). This requires more signal time for left turning movements which diminishes through capacity;
- Station platforms will be typically located with one end adjacent to a traffic signal. This will provide safe passage from the sidewalks to the platforms. Initially, it is not planned to have a signalized mid-block crossing at each platform, however, installation of these signalized mid-block crossings could occur as pedestrian volumes warrant.

Results of the traffic operations analysis indicate that construction and operation of the LRT Alternative will cause relatively minor reductions in LOS for through traffic on 400 South, 500 South, 400 West and North Temple. The current plan provides the same number of moving traffic lanes as are available today. LOS is classified in categories ranging from "A" (no congestion) to "F" (gridlock). Many of the intersections in the corridor analyzed will operate at LOS "D" or worse with the No-Build Alternative. With the LRT Alternative, the LOS for through movements is slightly worse. As summarized in Section 4.3 of the FEIS, the LOS for left turns is affected more significantly.

As mentioned above, two signalized pedestrian crossings may be eventually installed at each LRT station, except on the portion of 400 South where the LRT tracks are side running (station is in the sidewalk area). Generally, pedestrian movements will take place during the portion of the traffic signal cycle at the adjacent intersection when traffic is crossing the street where the station is located. Additionally, pedestrians crossing the street where an LRT station is located will not have to cross the entire street in one signal cycle. They will be able to walk to the platform area in the center of the street and then wait for the next cycle to cross the other half of the street. This should minimize the impact of these pedestrian crossings on through traffic traveling along the arterial street.

Engineering and design activities have included planning for pedestrian and bicycle travel along the corridor. As described above, stations will have signalized pedestrians crossings. Many stations will have racks in the vicinity of station platforms where bicycles can be stored by LRT passengers. Provision will be made to accommodate bicycles on-board LRT trains with possible limitations as to the number of bicycles per LRT car during peak periods of operation. Each LRT station will be equipped with a "high block" platform which enables mobility impaired individuals to negotiate a ramp that brings them to floor-level of the LRT vehicle. This ramp entrance is at the front of each train so that the operator can visually observe loading and unloading of mobility impaired persons. Standard ADA architectural features will be installed and incorporated into LRT station design.

## ENVIRONMENTAL CONSEQUENCES AND MITIGATION

### Visual and Aesthetic Impacts

Overall, the LRT Alternative would have minimal visual impact on the corridor. The catenary wires and infrastructure would be a visual element in the roadway. However, the LRT infrastructure will fit well into the urban visual element since there will be an existing LRT system in the downtown area. The LRT infrastructure will fit well into the urban visual environment at the University main campus and Health Sciences Center and at the airport.

There could be a net positive impact on visual quality resulting from redevelopment along North Temple and along 400 West, particularly in the Gateway District. LRT would support revitalization in the Gateway District which would encourage urban design and streetscape improvements, and create opportunities to integrate LRT with a new urban image of the Gateway area.

As part of the final design for the West-East LRT system, urban design features and amenities consistent with existing urban design features downtown will be incorporated. In addition, the catenary systems and LRT station design to fit SLC's aesthetic standards on the north-south line were included in the LRT Alternative. Visual setting and urban form mitigation is best addressed in designing the elements of the system. The residential and business community will be engaged in design and aesthetic review of the transit system. The stations and maintenance facility will be designed to blend into the fabric and character of the streets, and reflect quality and excellence in design. Screening, landscaping, and other mitigation measures will be used where necessary, as determined in the design phase of the project. Also, during the design phase, efforts will be made to minimize the removal of mature trees within the corridor. New trees will be planted as the street improvements are made and landscaped elements replaced that conform to the image and character already established. On campus, this will be accomplished by working closely with University of Utah Facilities Planning and Red Butte Garden and Arboretum, since the campus is part of the Arboretum.

Pedestrian crossings will be clearly identified for both the pedestrians using them and vehicles in the roadway. In all cases, pedestrian crossings to station platforms at the intersections will be signal controlled and phased to allow disabled patrons time to cross safely.

### Land Use: Secondary or Redevelopment Impacts and Support of Existing Uses

The LRT Alternative would generally have a positive effect on existing land uses and would encourage future land uses and redevelopment that are complementary to public transit. Existing Salt Lake City community and neighborhood plans are positively affected by LRT for the following reasons.

The potential for secondary development in the Gateway District and to the south and west of downtown is a positive implication of LRT development. Transit is an important element to positive change in the Gateway District–it lends a permanence to the area that can have a direct and positive influence in the scale and success of development projects. The momentum is already moving toward change in the Gateway District, and the West-East LRT line can stimulate development oriented toward pedestrian-friendly urban neighborhoods.

There would also be a positive impact at the airport, as the presence of LRT would support the planned development of the airport terminals and transportation center, and reduce the need for additional parking facilities.

The presence of LRT would support existing land use throughout the West-East Corridor. There are many commercial and office properties along North Temple and 400 South that could benefit from LRT access. Moreover, LRT could help reduce traffic and parking impacts to neighborhoods by improving access to the University. The potential for redevelopment along North Temple and 400 South would become greater with LRT in place.

One potential negative impact upon land uses created by LRT would be within the segment of 400 South between 400 West and 200 East. The LRT alignment will run along each side of 400 South, with eastbound LRT trains on the south side of the street and westbound LRT trains on the north side of the street. Besides affecting parking availability, the LRT line may affect vehicular access to properties and businesses, since the outermost lane in each direction would be exclusively used for the LRT system. Deliveries to properties could be affected by these curb cut and parking changes. Curb cuts could be consolidated to minimize potential conflicts.

### Land Use: Displacements and Relocations

The parcel of land between 2500 West and 2400 West, from North Temple Street south to the airport access road, will be purchased to construct the LRT maintenance and storage facility. As a result, six buildings will be displaced. Two buildings are vacant storage buildings. In one building, on property owned by the Salt Lake City Corporation (nearest the airport access road), there are two businesses. These businesses will need to be relocated. The Salt Lake City Corporation has the option to terminate the leases of the business at this location. Therefore, these businesses may not occupy this property at the time of LRT final design and construction. Of the three buildings that are along North Temple Street between 2500 West and 2400 West, one building holds a restaurant, another building holds the equipment of a technology company, and the other building holds the offices of three businesses including the technology company. The four businesses in the buildings at 2500 West and North Temple Street will also need to be relocated. The restaurant property is owned by the Salt Lake City Corporation. At the appropriate time, property and business owners will be contacted and business relocation procedures in accordance with the Uniform Housing and Relocation Act will be followed. Other commercial land and office buildings are available nearby to accommodate the businesses. Therefore, no long term effect is anticipated for any of these potential business relocations.

Because there will be no significant changes in land use or zoning as a result of implementation of the LRT Alternative, there is no mitigation required.

### Impacts to Parks and Open Space

Although one of the LRT tracks will be located along the north side of 400 South in the area of Pioneer Park (between 300 West and 400 West), preliminary engineering has indicated that the alignment can be constructed within the existing street ROW. Therefore, no direct impacts to the south side of the park will occur as a result of the single track alignment along 400 South. On the west side of the park the LRT alignment follows the centerline of 400 West. Therefore, no direct impact to the park is anticipated on its west side. The project is not anticipated to affect current use of the park property. Trimming or removing trees along Pioneer Park or Washington Square is not required. The trees along the street-edge are mature and already pruned high, which will allow for LRT overhead facilities, LRT vehicles, traffic, and street lighting.

The LRT Alternative will affect landscaped areas and street trees along South Campus Drive, Wasatch Boulevard, and Medical Drive. These locations are considered to be part of the State Arboretum of Utah.

Except for short term construction-related impacts, there are no anticipated negative impacts to any other parks and open spaces. LRT may, in fact improve access to several parks within the West-East Corridor. Further, urban design of stations in the Gateway District could incorporate City Creek in the proposed continuance of City Creek Park throughout the Gateway District.

## Impacts to Historic and Cultural Resources

There are no adverse effects to historic properties anticipated, as no historic houses or buildings would be displaced or affected in any way to accommodate the LRT Alternative. Even properties eligible for inclusion on the National Register of Historic Places will not be directly or indirectly affected by the LRT Alternative.

Throughout the length of the alignment, there is the potential for impact to prehistoric or historic archaeological resources wherever construction activity (i.e., excavation) will occur. In light of the past and recent discoveries of archaeological resources, these discoveries appear most likely in the Gateway District and the west downtown area of Salt Lake City; specifically, along 400 West and 400 South.

The Section 106 documentation for the West-East Light Rail project states that there is "No Effect" on historic structures and "No Adverse Effect" on prehistoric or historic archaeological resources due to the proposed LRT alignment. Prior to the construction, a program for monitoring the site for discovery of potential archaeological resources will be developed. Ongoing coordination with the SHPO will be maintained throughout the duration of the project, and in the event such discoveries are made, the agency official will notify the State Historic Preservation office (SHPO).

If, during construction of the project archeological or artifact remains are discovered, the Agency Official shall notify the State Historic Preservation Office (SHPO) at the earliest possible time with details of the discovery. The SHPO shall provide interim comments to the Agency Official within 48 hours of the request and final comments to the Agency Official within 30 days of the request. Procedures outlined in 36CFR 800.11 will be followed by the SHPO and Agency Official in developing a response to the discovery. In addition, an archeological monitoring contractor will be employed during construction. The frequency of and location of monitoring will be developed in consultation with the SHPO.

A Section 4(f) evaluation must be prepared when a proposed project would cause either the direct use of a Section 4(f) resource or the constructive use of the resource. Section 4(f) resources include park lands, wildlife refuges, conservation areas, wild and scenic rivers and historic structures and districts. These federal requirements result from the U.S. Department of Transportation Act of 1966. Land acquired from a historic property or a park for project right-of-way would constitute a direct use of a Section 4(f) resource. Excessive noise impacts on a state or national park to the point of impairing recreational activities would constitute a constructive use of Section 4(f) land.

The Section 4(f) resources within the West-East Corridor are Pioneer Park, Washington Square, the State Fairpark, Union Pacific Station, Exchange Place historic district, the City and County Building, Tenth Ward Square, Carlson Hall, the Fieldhouse (eligible for the National Register), and Fort Douglas. These parks and historic buildings have been noted in Section 5.4 and 5.5 of this FEIS. As already noted, no direct use impacts will occur as a result of the proposed construction of the West-East LRT project. In addition, analysis was conducted to determine if any constructive use impacts (such as noise, air quality, or lack of pedestrian access) would occur in the study corridor. For example, additional noise and vibration studies were completed at the Exchange Place historic district downtown and the Tenth Ward Square at 400 South/800 East. Analysis results show that no constructive use of any Section 4(f) resource would occur. Therefore, no

Section 4(f) evaluation is required as the result of the proposed construction of the West-East LRT project.

Extensive coordination has taken place with the appropriate agencies (e.g., Utah State Historic Preservation Office; Salt Lake City Department of Parks Recreation and University of Utah) throughout the West-East Corridor FEIS process. This agency coordination is documented in Section 7 of this FEIS.

## Socioeconomic Impacts

LRT will provide improved access to all major destinations and special generators of traffic within the corridor. LRT will also improve service for transit-dependent persons. Also, traffic and parking in residential neighborhoods would likely be reduced, thereby protecting the quality of life for residents.

LRT will offer opportunities for new or expanded employment to complement the existing commercial base. LRT could help to relieve parking pressures and ease traffic congestion downtown, and have a significant impact on planned redevelopment in the Gateway Area.

The segment of 400 South between 400 West and 200 East would have LRT tracks constructed along the outermost lanes of the roadway (westbound LRT track on the north side of the street and eastbound LRT track on the south side of the street). During construction, this could affect access to businesses and offices.

The implementation of the West-East LRT system would have positive impacts throughout the corridor; therefore, no mitigation measures are proposed. Short-term negative impacts could affect downtown property and business owners as a result of LRT construction. UTA plans to continue working with business and property owners through LRT design and construction to minimize any negative impacts that may occur.

## Ecosystems

The LRT Alternative will affect vegetation resources within the limits of construction. All of the vegetation to be affected is located in the western end of the corridor (along the airport access road), or in the eastern end of the corridor (in the landscaped areas along South Campus Drive, Wasatch Drive, and Medical Drive). The rest of the West-East Corridor is highly urbanized with the LRT located in the middle or along the edge of city streets. In these locations, the LRT line would not create any impacts to vegetation. The No-Build Alternative will have no effect on vegetation resources.

No significant long term impacts to existing stream channels or fisheries are anticipated, although some short term impacts to water quality and vegetation can be anticipated due to bridge widening.

While the greater Salt Lake area has habitat suitable for threatened and endangered species, the project corridor does not contain habitat listed as critical or sensitive for two identified avian species (bald eagle and peregrine falcon). Therefore, it is very unlikely that the LRT alternative would have an adverse effect on any threatened and endangered species. The No-Build Alternative will not have any direct effect on threatened and endangered species.

Impacts to wildlife could be reduced during construction by conducting filling and initial grading activities along the west portion of the corridor during the non-breeding season (late-August to mid-March). In addition, the trees could be removed in the early spring (February-March) or late summer/fall (August-November) to minimize impacts to birds using the trees for cover in winter or nesting.

## Impacts to Wetlands

The LRT Alternative will impact 4.89 acres of wetlands located within the LRT alignment. This impact is all located on the western end of the project along the airport access road.

The No-Build Alternative would not create any impacts to wetlands.

Mitigation for wetland impacts are as follows. Prior to construction, an individual Section 404 Permit will be obtained from the U.S. Army Corps of Engineers (USCOE). A Section 404 Permit application has been submitted to the USCOE which specifies that mitigation credits will be purchased from the Inland Sea Shorebird Reserve. The USCOE has agreed to a one acre to one acre replacement ratio for the 4.89 acres of wetlands affected.

## Water Resources and Floodplains

The LRT alignment crosses the North Point Canal, the Surplus Canal (twice), the City Drain (twice), the Brighton Canal, and the Jordan River. East of the transition from I-80 to North Temple, the LRT Alternative would not create direct impacts to the Jordan River, Brighton Canal, or City Drain. West of that transition, roads and bridges will have to be expanded, affecting the two crossings of the Surplus Canal and North Point Canal. Impacts to water resources will be temporary, construction-related impacts.

Best Management Practices (BMPs) will minimize sediment loads and effects on water quality on water resources and shallow aquifers. Runoff is expected to increase with the increase in impervious surface; existing sedimentation basins will be expanded to accept additional runoff. Minor impacts from urban runoff and non-point source pollution are not quantifiable and could be mitigated by use of BMPs during the construction.

Bridge widening may require a Utah Pollution Discharge Elimination System (UPDES) permit and a Stream Alteration Permit in addition to a Section 404 Permit for wetlands impacts. Construction and subsequent operation of the LRT will be managed to comply with Utah water quality standards. No Sole Source Aquifers subject to Section 1424(e) of the Safe Drinking Water Act (42USC300f et. Seq.) occur within the proposed corridor for the West-East Light Rail project. The Source Protection Area for one well (SLC-18) subject to the Wellhead Protection Program (Section 1428, PL99-339, June 19, 1986) is located within the proposed corridor (see Figure 3.8-1). Project activities within the Source Protection Area (University of Utah campus) will be subject to Section 21A.34.060 of the Salt Lake City Code (passed by the City Council on December 1, 1998) which requires groundwater source protection.

Expansion of the bridge over the Surplus Canal will require construction within the 100 and 500-year floodplains. City and County ordinances and regulations for construction within a floodplain will be followed. The project will ensure that the flood capacity of the watercourse and its floodplain will not be diminished by construction.

The No-Build Alternative would have no construction impacts associated with water resources or floodplains, but would have larger numbers of VMT, and therefore, would create greater quantities of pollutants in runoff than the LRT Alternative.

## Mineral Resources

Due to the primarily urban character of the study area, mineral resources are either inaccessible or are not economically viable. The LRT Alternative would not interfere with the extraction of any known mineral deposits in the corridor. The No-Build Alternative would not affect mineral resources. No mitigation measures are required.

## Noise and Vibration

The main operational noise and vibration impact to noise receptors would be from vehicular traffic along the alignment. Noise and vibration levels were field measured and modeled for the projected year 2020. The No-Build and LRT Alternatives were evaluated for noise impacts along North Temple, downtown, and 400/500 South. The analysis results showed that noise levels along the corridor will be high, but most of this noise will be created by automobile traffic irrespective of whether LRT is constructed or not. The incremental increase in noise from the LRT Alternative over the No-Build Alternative will be imperceptible overall. Operational vibrations, assuming "frequent events" created from LRT will exceed FTA's criteria for commercial, institutional, and industrial properties within 50 feet from the nearest track. The residential impact criteria would be exceeded within 70 feet of the nearest track. However, no commercial buildings or residences are located within 50 and 70 feet, respectively, of the LRT track.

No noise and vibration mitigation measures are recommended for the No-Build alternative because there would be no new construction.

The receptors identified in the previous discussion as being impacted by operational noise from the LRT system are the residences located along the alignment and commercial receptors along 400 South east of 200 East. The main noise impact to these receptors would be from vehicular traffic along the alignment. Since existing noise levels exceed NAC criteria and the proposed LRT Alternative only increases noise levels between a minimum of 1 dBA and a maximum of 3 dBA (3 dBA is the smallest difference perceptible by the human ear), no noise mitigation measures are recommended especially in light of the effects of auto traffic alone. No vibration mitigation measures are recommended since no vibration impacts resulting from LRT operation are anticipated.

Short-term construction noise impacts are expected. Several possible construction mitigation measures are given in Section 5.19 which can be applied when construction activities are within 500 feet of sensitive receptors. Good public relations with the community are necessary to minimize public reaction to unavoidable noise. It is recommended that communities be notified in advance of the construction scheduling and duration.

## Utilities

The LRT Alternative will require the relocation of utility lines running beneath and parallel to the alignment, as well as lines crossing the right-of-way, which are located closer than approximately three feet from the surface. Overhead utilities will be affected to a lesser degree since resolution of conflicts with the catenary wire infrastructure will not require excavation. For underground utilities, conflicts are generally minimized in those locations where LRT tracks run down the center of the street. In contrast, substantial conflicts are anticipated along the section of 400 South (between 400 West and 200 East) where the tracks are proposed to run along the north and south sides of the street. Some of the affected utilities include:

- Electric
- Telephone
- Gas
- Sanitary Sewer
- Storm Sewer
- Water

Coordination with the affected utility companies will continue through final design and construction of the proposed project.

## Air Quality

The West-East LRT project is part of the Long-Range Transportation Plan which has been formed to be in conformance with air quality standards.

The purpose of the air analysis was to determine CO concentrations at critical locations (receptors) within the West-East Corridor to ensure that the U.S. EPA's National Ambient Air Quality Standards for CO would not be violated by this LRT project. With the oversight of the Utah Department of Environmental Quality's Division of Air Quality (DAQ), the project team modeled the anticipated CO emissions at six "worst case" intersections. The models that were used were MOBILE5a, an emissions rate model, and CAL3QHCR, a dispersion model. Detailed CO modeling results are presented in Section 5.13 of the FEIS. The modeling results in Section 5.13 indicate that no intersections are predicted to experience significant, project-related CO levels that exceed the NAAQS standard. At additional locations with possible eight-hour public exposure, additional receptors were modeled. None of these receptors would be impacted by CO levels that exceeded standards in any scenario.

No specific mitigation measures are called for since the project will not create any significant impact.

## Potential Contaminant Sources

Sites with potential or documented history of contamination are of concern because of liability issues that could arise from migration of contamination into the corridor. In addition, worker exposures to toxic materials during construction are an additional potential concern. A Phase I Environmental Site Assessment was performed to determine the potential for contamination within the corridor. The analysis contained a records search of databases and included a visual inspection of sites along the corridor. The Phase I analysis determined that several sites (mostly in the western half of the corridor) could warrant additional investigation, including subsurface testing (a Phase II Assessment) to determine the likelihood of contamination. A Phase II

Assessment has been conducted for six sites. Potential contaminants were detected at two sites: 2211 West North Temple (acetone and freon) and 55 South Redwood Road (petroleum hydrocarbons). The potential contaminants are located off site where construction will take place in the existing roadway prism. In addition, additional Phase II soil sampling may be necessary in the North Temple viaduct area around the proposed LRT bridge footings.

A Phase I Site Assessment has been conducted for the parcel of land located south of North Temple Street between 2500 West and 2400 West. This parcel of land, which contains six buildings, will be purchased and used for the LRT maintenance facility. The results of the Phase I assessment show that asbestos and lead paint may be present in the building materials of the two vacant buildings. Also, past groundwater contamination has occurred as evidenced by the groundwater monitoring wells near one of the vacant buildings. A Phase II site assessment will be conducted before final design is completed to more accurately assess the potential contaminant sources of the buildings that would be displaced. If the Phase II analysis determines that sufficient contamination is present at any of these properties, the best remedial alternative will be proposed, based on effectiveness in alleviating risk to human health and the environment, efficiency of contaminant removal, and cost. State and federal agencies will participate in the process as is appropriate.

### Construction-Related Impacts

A detailed discussion of construction related impacts and mitigation measures is included in Section 5.19.

### Environmental Justice Considerations

Although both minorities and low income persons live within the study corridor, none of the subareas in the corridor have a majority of minority or low income residents. Impacts and benefits would be distributed evenly throughout the corridor. Since a disproportionate burden or impact cannot be shown for low income or minority residents or minority business owners along the corridor, no negative environmental justice impact can be demonstrated. No mitigation measures are required.

## FINANCIAL ANALYSIS AND EVALUATION

The major findings of the financial analysis are:

- Assuming voter approval of an additional ¼ percent sales tax in 2000, UTA will have adequate financial capacity to fund the West-East Light Rail project construction and operation while continuing to operate the new North-South LRT project and to expand operation of its bus services throughout the 1997-2017 project period.

- Throughout the 1997-2017 period, UTA will have sufficient annual Net Revenues for payment of debt service on its outstanding bonds.

- In the absence of the proposed additional ¼ percent sales tax, the level of these Net Revenues combined with UTA's capital grant revenues would be insufficient to pay for both debt service requirements and the Authority's operating needs related to the West-East

Light Rail line. The additional sales tax will assure the Authority adequate funding for the West-East line and for other future capital projects proposed in the long range transportation plan recently adopted by the Wasatch Front Regional Council.

- If voter approval of an additional ¼ of 1 percent sales tax did not occur in 2000, UTA would return to the voters in a subsequent year. For sensitivity testing purposes, an alternative financing plan was considered whereby voter approval was deferred until 2006. Under this scenario, an annual subsidy of $5 million would be required for the first five years of operation of the West-East Light Rail line over the 2002-2006 period. UTA is seeking the commitment of these funds from a variety of sources, including the State of Utah, City of Salt Lake, and other public and private sources.

## PUBLIC INVOLVEMENT AND AGENCY COORDINATION

Public and stakeholder involvement has been an important component of the decision-making process for the West-East Transportation Corridor in Salt Lake City. This has been especially true as the project moved forward in the preparation of the Final Environmental Impact Statement (FEIS) and Record of Decision (ROD). As a result of comments received on the Major Investment Study/Draft Environmental Impact Statement (MIS/DEIS) and input received during agency coordination, issues and questions were raised that have been addressed by the project study team. Each public participant and agency has unique interests and perspectives as to what should be the transportation solution for the West-East Corridor. Therefore, input from residents, public and private interests and regulatory agencies was sought throughout the FEIS process. The FEIS public involvement plan continued the information exchange and communication links that were formed during the MIS/DEIS phase. Moreover, it was designed to create new opportunities for discussion and dialogue with project decision makers about planning and design issues specific to the locally preferred alternative (LPA), a light rail transit (LRT) system. A complete discussion of the public involvement activities for the FEIS process are included in Section 7.

Close coordination with the resource and regulatory agencies occurred throughout the FEIS process. Issues, concerns and potential environmental impacts that were identified during the MIS/DEIS process as well as those raised during agency coordination meetings were addressed during the FEIS study. All agencies were kept informed as to the project status, schedule and results of the environmental analysis. In some cases, such as the U.S. Army Corps of Engineers, permitting requirements and time lines were discussed and integrated into the overall project schedule. This list of agencies includes, but is not limited to:

- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife
- U.S. Environmental Protection Administration, Utah Region Office
- U.S. Department of Agriculture (Natural Resources Conservation Service)
- Utah Department of Environmental Quality
- Utah Department of Natural Resources
- Utah State Historic Preservation Officer
- Utah Division of Air Quality
- Utah Department of Transportation

Summaries of individual agency meetings were documented. Agency follow-through occurred during the FEIS phase of the project, such as sending agencies regular project mailings or newsletters and answering agency questions and information requests as quickly as possible. Nine federal, state, and local agencies responded to an agency coordination letter regarding the West-East LRT project. Their comments and issues are documented in Section 7 of the FEIS.

# SECTION 1
# PURPOSE AND NEED

## 1.1 NEED FOR PROJECT

### 1.1.1 Introduction

The Salt Lake City Area is projected to reach a population of over 1.357 million by the year 2020. Including the Provo and Ogden areas, the population of the Utah Wasatch Front Region will exceed 2 million by 2020. The Wasatch Front Regional Council (WFRC), the Utah Transit Authority (UTA), the Utah Department of Transportation (UDOT) and the City of Salt Lake, in cooperation with other agencies and entities, have proposed transportation improvements along a West-East Corridor extending from the Salt Lake City International Airport (SLCIA), through downtown Salt Lake City, to the University of Utah, connecting three of the largest generators of traffic in the Salt Lake region. In its Long Range Transportation Plan, WFRC identifies this corridor as one for potential major transit investments: a vitally important anchor corridor that will help form the foundation of a regional transportation network. Improvements in the West-East Corridor have broad implications for upgrading the entire regional transportation system, because so many daily trips travel to or through this corridor. A detailed description of average daily traffic along the corridor is provided in Section 4 Transportation Impacts.

Interest in transportation improvements along the West-East Corridor has developed from several sources. As mentioned above, studies predict a significant population and employment increase (50 percent) by 2020. Interstate 15, part of the regional north-south highway system, is expanding as well. Through the Salt Lake area, I-15 is currently being reconstructed to upgrade the viaducts and to add a high occupancy vehicle lane, one additional traffic lane and an auxiliary lane in each direction. Utah Transit Authority is constructing a light rail transit line from Sandy to downtown Salt Lake City. This line will carry not only downtown-bound passengers, but also passengers traveling to the airport and University. The North-South LRT line will be the backbone of a regional transit system, as I-15 is the backbone of the regional highway system. The Gateway Intermodal Center, currently being planned by Salt Lake City, will be located at 200 South 600 West. This center will provide shared facilities for LRT, Amtrak, UTA and Greyhound buses, and potentially, a proposed commuter rail line. Interstate 80 is undergoing reconstruction to increase roadway capacity.

The proposed West-East Corridor serves as a distributor corridor to both north-south transit and highway systems. The three entities that generate the most automobile traffic in the corridor—the SLCIA, downtown, and the University of Utah have created a pressing need to implement transportation improvements in the corridor to link these entities to the regional transportation system. Neighborhoods which are located between these generators, and are affected by the regional traffic filtering through the residential areas to reach these large destinations, will benefit from the Locally Preferred Alternative, light rail transit (LRT) in the corridor. In addition, there are many special traffic generators in or adjacent to the corridor, such as the State Fairpark, Temple Square, Research Park, and Hogle Zoo, that will be accommodated by the proposed West-East LRT line. Currently, there are no bus routes which provide service from one end of the corridor to the other, so the proposed West-East LRT line offers improved service between the major destinations within the corridor. Moreover, as population and traffic congestion increase in the corridor and region, the West-East LRT system will accommodate regional as well as local ridership.

As a final consideration, Salt Lake City will be hosting the Winter Olympic Games in 2002. During the games, traffic at the airport will intensify significantly and many of those arriving at the airport will need transportation to the downtown and University areas.

### 1.1.2 Future Growth

Within the West-East Corridor, there are a wide range of land uses, including commercial, office, industrial, and some residential uses. There are also variations in socio-economic characteristics of population and employment, which have grown significantly in the last few years. Wasatch Front Regional Council (WFRC) forecasts show population in the Salt Lake urban area will grow from 906,935 in 1995 to 1.357 million by 2020. Employment is forecasted to rise to 698,549 by 2020 from 474,096 in 1998. Within the West-East Corridor itself, population is expected to grow from roughly 50,000 in 1990 to 72,372 in 2020. Non-agriculture, non-construction employment in the corridor is expected to increase from 130,000 in 1990 to over 200,000 in 2020.

As already mentioned, three of the largest traffic generators in the Salt Lake Valley lie within the corridor. The west end of the corridor contains the SLCIA and surrounding businesses. SLCIA generated an average of 76,000 vehicle trips per day in 1993 and is predicted to generate 118,000 trips per day by 2020. Air traffic through SLCIA is expected to double in the next 20 years and will place increased demand on existing transportation facilities. It is anticipated that travel to the airport will increase substantially, including automobile traffic. Because the SLCIA's primary access is from Interstate 80 (which extends west-east), much of the traffic generated by the airport approaches from the east. North Temple also provides a significant local access route to the airport area.

In the center of the West-East Corridor, downtown Salt Lake City is the largest generator of traffic in the Salt Lake Valley, producing an average 380,000 vehicle trips per day in 1993. This number is expected to jump to 441,000 by the year 2020. Travelers approach downtown from all directions, but the primary approaches of automobile traffic are from the south and north. Secondary, but significant trips are generated by those who live in residential areas east and west of town and commute to and through the downtown area by a combination of west-east and north-south routes. The downtown and adjacent areas include a wide variety of traffic generators, including large employers, most of whose traffic is generated during weekday rush-hour periods. Other traffic generators include special event facilities, shopping, and entertainment centers, which tend to generate more traffic during the evenings and on weekends. Internal traffic circulation is also an issue in the downtown area.

At the eastern edge of the corridor, the University of Utah, the University Hospital and Primary Children's Medical Center, and Research Park, together generate approximately 180,000 vehicle trips per day. This is expected to increase to 212,000 vehicle trips per day by 2020. Most of these trips originate outside the immediate proximity of the University area and, therefore, contribute to travel demand and congestion on a variety of routes. Traffic generated by the University includes travelers associated with campus academic programs, and employees and patients at University Hospital and Primary Children's Medical Center. Additional traffic is also generated in that area by the 4,200 employees at firms in Research Park and by members of the public traveling to the

University to attend sporting events, concerts and other special events held on the campus. Other traffic generators in the University area include Hogle Zoo and This Is The Place State Park.

The "University Corridor Transit Study," commissioned by WFRC in 1993, cites employment growth at the University and Research Park, as well as growing enrollment at the University, as reasons to implement transportation improvements. Adequate parking will continue to be a concern, especially as new office and facilities construction continues, making available land scarce. Also, community groups want to discourage campus-bound traffic on such streets as 1500 East, South Temple and 200 South. The University plans to channel more of this traffic to major approaches such as Foothill Drive, 1300 East and 500 South by making parking most accessible from these routes. To address the issue of campus circulation, the University is planning to develop an internal people mover system that would connect to the LRT system in the West-East Corridor.

In addition to the primary traffic generators in the corridor, each section of the corridor contains facilities that generate large volumes of traffic on a less regular basis. The airport generates additional traffic volumes beyond its normal flow, primarily during holiday and summer travel periods. Special events facilities such as the Delta Center (located downtown), and Rice-Eccles Stadium and the Huntsman Center (both located on the University campus), all sponsor periodic events that also draw large crowds. These events often generate high traffic volumes in the evenings and on weekends. These factors create the need for the West-East LRT system which can quickly and efficiently provide additional capacity for short periods of time.

**Future Growth By Type: Residential, Retail, Industrial**

The discussion above examines growth by location. The growth within the corridor can also be viewed in terms of the type of growth that is expected to occur (see Figure 1.1-1). Residential growth between 1995–2020 is expected to be relatively modest, with a projected increase of about 25.4 percent over that 25-year period. This measure is based on the number of additional dwelling units that are likely to be built. The rate of retail growth will be somewhat higher, measuring 36.5 percent over the next 25 years. Finally, industrial growth, estimated at 40 percent by 2020, will see the largest increase in the corridor. This is primarily because the current industrial area near the airport has the most undeveloped area in the corridor.

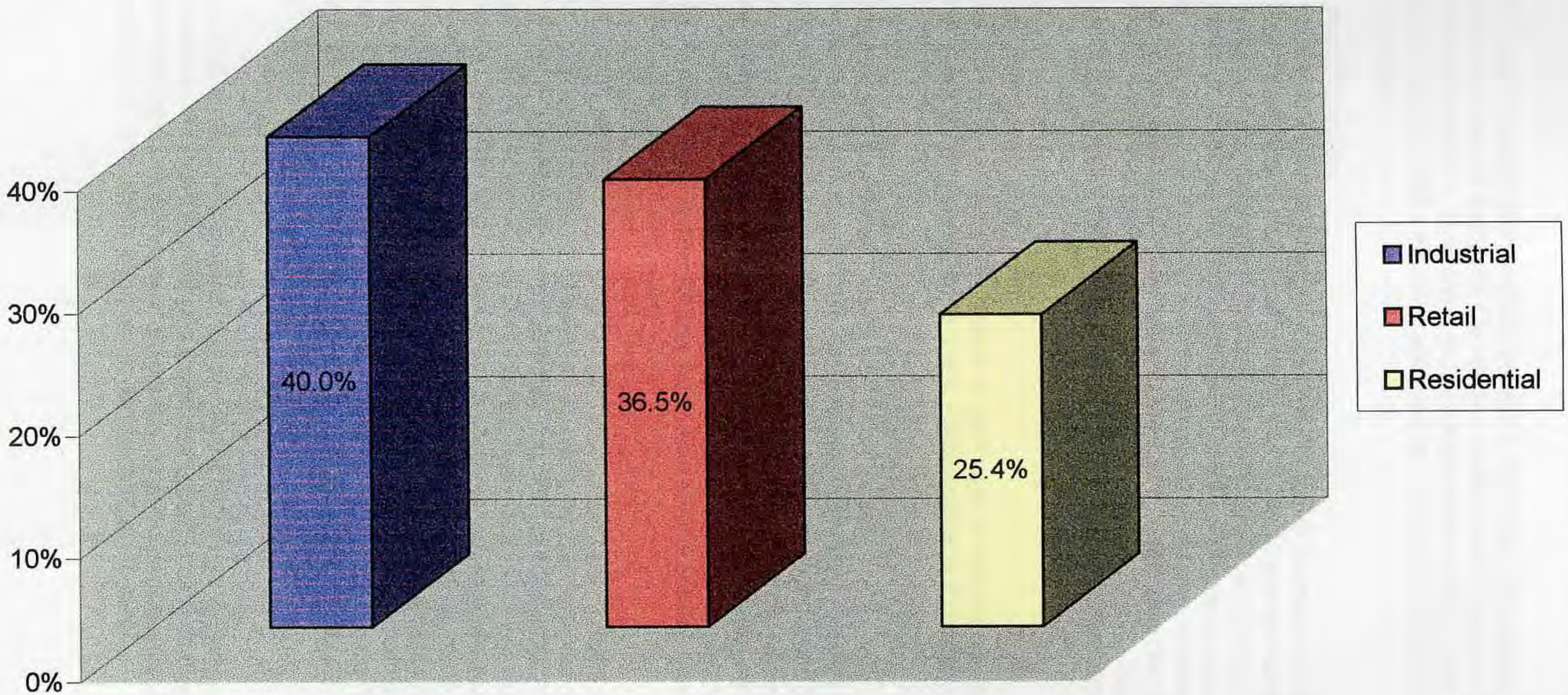
### 1.1.3 Urban Travel Growth, Patterns, and System Capacity

Travel in the Salt Lake area is projected to grow significantly over the next 20 years. Total trips will grow by 67 percent, from 3 million trip-ends per day to 5 million in 2020. Vehicle miles traveled (VMT) will grow even faster, from current levels of 21 million to 36 million in 2020, or 71 percent. Both of these increases outstrip the projected rate of growth in population and employment in the region. A number of factors contribute to this higher growth rate for travel:

- Land use patterns and dispersed development;
- Increased trip-making;
- Higher levels of car ownership;
- Increased drive-alone rate; and
- Population and employment growth.

These factors contribute to the delays and the lack of mobility Salt Lake City area drivers are already experiencing in the corridor. One factor by itself would not necessarily generate much traffic congestion, but when combined, these factors have resulted in dramatic increases in congestion.

## Projected Growth in Space in the Corridor by Land Use Type, Years 1995-2015






West-East Corridor
Growth in the Corridor

Figure 1.1-1

In a 1993 report, the Texas Transportation Institute listed the Salt Lake City urban area–which includes all of Salt Lake City, most of Salt Lake County and south Davis County–as having the second largest percentage increase in congestion in the nation between 1982 and 1990, at 35 percent. As this trend continues, Salt Lake City will need to be prepared for the anticipated increases in traffic congestion.

**Land Use Patterns and Dispersion**
Two land use patterns in the Salt Lake urban area have developed that increase the dependence on the automobile. First, residential land use patterns are dominated by single-family housing. While the acreage in suburban high density (6-15 people/acre) has grown in past decades, it has not yet surpassed the amount of acreage in suburban low density (3-6 people/acre) and exurban rural (1-3 people/acre). The acreage of residential development with more than 15 people per acre has not increased appreciably and amounts to about four percent of the area occupied by low density suburban land use. Second, another land use pattern that increases auto dependence is the separation of commercial and residential uses. Commercial/industrial use has become spread within defined pockets throughout the Salt Lake urban area requiring people to travel long distances to get to work or run errands.

The project is expected to increase the intensification of land uses in the corridor and city and regional growth management policies support this trend. See Section 3.5, Demographics and Economic Activity, for more information.

**Increased Trip-Making and Vehicle-Miles Traveled**
Another factor contributing to traffic congestion is an increasing trip rate. In 1993, the WFRC conducted a daily travel survey of about 3,000 households located throughout the Ogden, Salt Lake, and Provo urban areas. The last time such a survey was conducted in the region was 1962. Across the entire region, daily auto trips per person have increased from an average of about two-and-a-half in 1962 to more than four in 1993. Trips per dwelling unit and per employee have also grown. Daily auto trips per auto have decreased only because of the increasing number of cars per person, which is discussed later in this section.

Vehicle miles traveled (VMT) reflects trip-making activity. The projected increase in Highway Performance Monitoring System (HPMS) adjusted VMT in Salt Lake County from 1990 to the projected year 2020 is about 97 percent, up from 16,126,000 daily VMT in 1990 to 31,784,000 daily VMT in the projected year 2020. These regional trends reflect national trends. For motorists, the largest growth occurred both nationally and regionally in non-home-based, personal-business trips, such as driving from work to a restaurant for lunch. Overall, the factor underlying traffic congestion is growth in auto ownership. Nationally, between 1969 and 1990, the number of autos per household increased from 1.16 to 1.77. According to WFRC travel surveys, auto ownership in the region grew from about 1.2 per household in 1962 to about 1.89 in 1993. This number is expected to increase to 2.02 by 2020. Auto ownership within the corridor, however, is lower at 1.05 but is expected to increase to 1.21 by 2020.

**Drive-Alone Rate**
A high and increasing drive-alone rate is another primary cause of traffic congestion in the Salt Lake urban area and the West-East Corridor. While the discussion here is on work trips, the drive-alone rate for other trips also has also increased. Across the Wasatch Front between 1980 and 1990, the drive-alone rate for work trips grew from about 67 percent to 76 percent.

Although the Wasatch Front Regional Council (WFRC) Long Range Transportation Plan (LRTP) projects a 15 percent decrease in the drive-alone rate for work trips by 2020, the projected decrease will not be sufficient to prevent congestion from getting worse, as congestion in the urban area is projected to grow faster than either VMT or population. Weekday VMT is expected to increase from about 18 million miles to 34 million miles. Financially constrained plans for additional lane miles only include an increase of approximately 0.5 percent a year of total regional lane miles. Consequently, even though the LRTP includes almost $1 billion in highway and transit capacity improvements in the Salt Lake City area, peak-period speeds along freeways and arterials will fall to an average of about 15 mph. This will result in peak-period delays totaling more than 150,000 person-hours each weekday. Assuming an average hourly wage of $11.00, this results in more than $1.65 million lost each day, not including associated fuel costs. For the average commuter, this delay equates to roughly 10 to 20 minutes twice a day on the most congested facilities.

In addition to these decreases in mobility, accessibility is also projected to be severely reduced. The average portion of work trips under traffic congested conditions in 2020 is predicted to be over 30 minutes, up from 20 minutes in 1990. It is important to note that without the improvements in the LRTP, congestion would be much worse in 2020. For example, peak speeds on arterial streets would fall below 10 mph.

**Traffic Congestion on North-South Streets Providing Access to the Corridor**

Congestion is a problem on many north-south streets that deliver traffic into the corridor. Several highways, principal arterials and minor arterials deliver traffic into the corridor from the south, including I-15, I-215, 5600 West, the Bangerter Highway, 2700 West, Redwood Road, 300 West, State, 700 East, 1300 East and Foothill Boulevard. All of these access routes face severe congestion problems during peak hours and traffic projections forecast continued growth, as shown on Table 1.1-1. Overall, traffic on these routes will increase by approximately 40 percent by 2020. Whereas, overall capacity will increase by only 20 percent from 1993 to 2020, despite planned improvements to these routes.

The only access to the corridor from the north is via two highway routes—I-15 and I-215—and two minor arterials—Beck Street and Redwood Road. At peak hours, large and rapidly increasing numbers of vehicles attempt to squeeze through a narrow corridor where usable land is pinched between the foothills and the Great Salt Lake. On these routes, traffic is expected to increase by 76 percent from 1993 to 2020, while capacity will increase by only 20 percent in that time (see Table 1.1-2).

| Table 1.1-1<br>Increase in ADT From South | | | |
|---|---|---|---|
| **Route** | **24-hr Vehicle Count (1993) (busiest section)** | **Projected 24-hr Vehicle Count (2020) (busiest section)** | **Percent Increase 1993-2020** |
| 5600 West | 17,875 | 66,000 | 269 |
| Bangerter Highway | 38,255 | 69,000 | 80 |
| 2700 West | 19,150 | 27,000 | 41 |
| I-215 | 84,970 | 144,000 | 69 |
| Redwood Road | 51,080 | 57,000 | 12 |
| 300 West | 27,355 | 45,000 | 65 |
| I-15 | 181,695 | 218,000 | 20 |
| State Street | 38,510 | 55,000 | 43 |
| 700 East | 50,715 | 67,000 | 32 |
| 1300 East | 44,075 | 48,000 | 9 |
| Foothill Boulevard | 45,440 | 54,000 | 19 |
| **Totals** | **599,120** | **850,000** | **42** |

| Table 1.1-2<br>Increase in ADT From North | | | |
|---|---|---|---|
| **Route** | **24-hr Vehicle Count (1993) (busiest section)** | **Projected 24-hr Vehicle Count (2020) (busiest section)** | **Percent Increase 1993-2020** |
| I-15 (North of SLC) | 111,820 | 191,000 | 71 |
| I-215 (North of SLC) | 41,500 | 107,000 | 158 |
| Beck Street | 31,275 | 49,000 | 57 |
| Redwood Road | 16,300 | 22,000 | 35 |
| **Totals** | **200,895** | **369,000** | **84** |

These increases in traffic volumes without accompanying increases in system capacity will lead to further increases in congestion unless travelers move to different modes or adjust their travel times.

### Traffic and Parking Impacts on Neighborhoods

Another transportation problem in the West-East Corridor is that traffic seeking to reach some of the larger traffic generators often filters through residential neighborhoods, either searching for a faster route or searching for parking when it is unavailable at the destination. This is particularly problematic in the neighborhoods surrounding the University, but it also occurs to a lesser degree in downtown.

Several approaches to the University offer no clear, high-volume vehicular route. The routes that are available, such as 1300 East (approaching from the south) and 400/500 South (approaching from the west), are wholly inadequate to handle all of the traffic bound for the University from the south and west and, therefore, are severely congested during peak hours. On 1300 East, the street narrows from two lanes down to one at 2100 South, causing large bottlenecks of northbound traffic in the morning. These bottlenecks and the resultant congestion encourage traffic to select alternate routes, such as 1100 East, which increases the level of traffic in residential areas adjacent to 1300 East. Another problem on 1300 East is there are many homes located on this street and residents find it nearly impossible to back out of their driveways onto 1300 East during peak hours.

A similar situation exists approaching the University from the west, as there is no clear west-east route from downtown to the University. Traffic comes into Salt Lake City from the north (e.g. Davis County) and then turns east toward the University. South Temple, which initially appears to be the most sensible route, has frequent traffic signals that slow traffic to a crawl during peak hours. Further south, 400 South is a wide commercial street that accommodates larger traffic volumes. Currently, this road becomes congested because of high demand during peak hours and traffic signaling patterns. Because these two main streets are less than desirable at peak hours, traffic coming from Davis County tends to spread out onto a variety of residential streets, including 100 South, 200 South, 300 South, and 2nd Avenue, causing congestion and high traffic volumes in otherwise quiet residential neighborhoods.

**Lack/Location of Adequate Parking**

The availability of adequate, close-in parking is a problem at all three of the major trip generators in the corridor—SLCIA, downtown and University of Utah. Parking demand at SLCIA is growing daily. Over the past several years, the passenger mix at SLCIA has changed significantly. In the past, about 60 percent of enplaning (boarding) passengers were transferring passengers from another flight. Only 40 percent of the enplanements represented local travelers accessing the airport. Today, that relationship is essentially reversed, with 60 percent of the enplanements having local origins and 40 percent transferring from another flight. Employment at the airport is also increasing. Almost all employees arrive at the airport by auto and need parking. In developing the Airport Master Plan, SLCIA explored strategies to increase parking supply and, at the same time, reduce the high level of dependency on automobile travel to the airport.

Because the number of parking spaces in downtown is decreasing, the overflow from downtown occasionally causes parking problems for surrounding neighborhoods. The limited number of downtown parking spaces often leads to traffic congestion on city streets, as vehicles circulate in search of parking spaces. Any overflow from downtown events is usually accommodated on city streets, which are generally mixed-use in the areas surrounding downtown and gradually become more residential farther from downtown. Construction of new buildings in downtown is eliminating the supply of surface parking. Thus, while demand for parking is increasing, the supply of parking is diminishing. Downtown currently contains approximately 1,100 on-street metered parking stalls and another 25,000 stalls in its 69 public parking lots. Many of the large parking garages maintain occupation rates of 100 percent; the average usage rate is 81 percent. Salt Lake City's Downtown

Alliance, an association of downtown businesses and merchants, is looking for alternatives to solve the short- and long-term deficiency in parking supply. Existing facilities are frequently at capacity and customers have to circulate around the area to find a parking location. Circulation of traffic seeking available parking causes more congestion and creates more pollution.

Lack of adequate parking at the University results in parking overflow into adjacent neighborhoods. During the first week of classes and at a variety of special events, vehicles quickly exhaust the capacity of the University's parking lots and begin parking in the surrounding residential area. This problem has been addressed in the immediate vicinity of the campus through "resident only" parking zones, but this solution has simply forced vehicles to park one or two streets farther away, where on-street parking is not restricted. Land requirements for parking areas and structures on campus reduce the amount of land available for other campus facilities. In its current master planning activities, the University is aggressively pursuing options and strategies to reduce the requirement for parking at all areas of the campus. The University is also exploring ways to increase transit use and reduce the number of people who arrive in single occupancy vehicles.

**Internal Circulation Within Large Traffic Generators**

Internal circulation is a major need and deficiency at the SLCIA, downtown and the University of Utah. In addition, the West-East Corridor itself has a significant collection/distribution function for trips entering the corridor from other areas of the region.

Internal transportation at the airport is needed to carry employees to and from large employment centers, such as Delta's reservation center and hangars. The details of this circulation system will be developed as part of the current master planning activity. An effective land-side circulation system has the potential for significantly reducing the number of vehicles that would need to be accommodated on the existing and expanded circulation roadways serving the terminals. Traffic congestion would be reduced and air quality would generally be improved if such a circulation system were implemented as the airport continues to expand.

In the downtown area, studies are currently underway at UTA to develop an appropriate circulation system to complement the planned North-South LRT system. This local circulation system becomes even more important with possible implementation of a major transit system in the West-East corridor. Downtown anticipates a significant increase in local circulation demand with increasing activity at Temple Square, the new Salt Palace Convention Center and at expanding retail and office establishments. Amtrak passengers, as well as potential commuter rail passengers, will also need a good downtown circulation system.

The existing circulation system at the University utilizes several shuttle routes that travel clockwise and counterclockwise around the periphery of the campus. Cross-campus circulation is limited to walking and circuitous auto travel. There is also a need for better circulation between the three University areas: Main Campus; Health Sciences; and Research Park. Long walking distances and regular interaction between these areas call for further improvements in the University's internal circulation system. In its master planning activity, the University is attempting to define a more effective system to help people get around campus.

### 1.1.4 2002 Winter Olympic Games

Salt Lake City will host the Winter Olympic Games in February 2002. For a three-week period, the entire Salt Lake City metropolitan area will experience an abnormally high traffic demand. The location for many of the activities and accommodations will be focused in the corridor. For example, nearly 22,000 athletes, coaches and trainers will arrive at the airport, where most will need to pass through customs and all will be certified by the International Olympic Committee. They then will be transported to the Olympic Village located at the University of Utah. Throughout the games, participants will travel from the Olympic Village to awards ceremonies, which will be held in downtown Salt Lake City and event venues, which will be held as far away as Snow Basin, West Valley, Park City, and Deer Valley.

Additionally, thousands of spectators and media personnel will also arrive at the airport and will need transportation to their accommodations, (many hotels are located downtown) and to various events and ceremonies. The largest events are likely to be the opening and closing ceremonies, which are expected to draw some 50,000 spectators to the Olympic (Rice-Eccles) Stadium, located on the University campus. Other large-draw events will include daily award ceremonies, alpine skiing (in Ogden and Park City), nordic-combined and cross-country skiing (near Heber/Midway) and ice hockey and figure skating (in downtown Salt Lake City). While not all of these events will occur within the corridor, a vast majority of the trips will originate and terminate inside the corridor, where most athletes, spectators and media personnel will be staying. In addition to the traffic generated by Olympic events, the corridor's transportation system will need to accommodate regular daily traffic during this time. This traffic currently causes congestion at peak periods and is projected to continue growing through 2002.

## 1.2 STUDY MISSION AND GOALS

**Mission Statement**

The mission of the West-East Light Rail FEIS was to select the best ways to meet future travel needs within the West-East Transportation Corridor. To this purpose, WFRC, UTA, UDOT, and Salt Lake City, in cooperation with other agencies and entities, prepared a Major Investment Study (MIS) and a Draft Environmental Impact Statement (DEIS) during the past three years. The MIS/DEIS was released to the public and regulatory agencies for review and comment on August 1, 1997.

The West-East MIS/DEIS identified the need for future major transportation investments in the West-East Corridor and developed recommendations and environmental documentation to meet those needs through examination of a reasonable range of alternatives. Between May 1996 and July 1997, the MIS process developed alternative approaches to transportation improvements in the corridor on the basis of feasibility and cost-effectiveness. The DEIS evaluated a range of alternatives with environmental analysis and documentation. The DEIS study selected a Locally Preferred Alternative (LPA), identified possible funding sources, and determined the feasibility of the preferred Light Rail Transit (LRT) Alternative. The study examined the alternative of taking no action, as well as action alternatives including investments in highway and transit improvements. The DEIS process, required by the National Environmental Policy Act (NEPA) of 1969, was used to evaluate the environmental impacts of the alternatives as they were developed. The DEIS documented the range of alternatives initially considered in the MIS and described the rationale for the selection of the LRT Alternative. Site-specific environmental impacts for the LRT Alternative, design options and mitigation strategies were documented for public and agency review and comment. Additional technical analysis was also conducted for environmental resources during the preparation of this Final Environmental Impact Statement (FEIS).

During the 45-day review period for the MIS/DEIS, the public had an opportunity to comment on and provide input to the various transportation alternatives and the LPA's design options and mitigation commitments. After circulation and consideration of written and oral comments, design options were refined through preliminary engineering of the LPA and specific mitigation strategies were developed. These mitigation strategies are documented in the FEIS and will also be included in the Record of Decision (ROD) document. (See Section 7, "Public Involvement and Agency Coordination," for further information).

### Goals of the Study

Specifically, the West-East Light Rail FEIS sought to identify improvements that would be feasible and cost-effective. The initial goals were to choose an alternative which:

- Interfaces with the regional transportation (including transit) system;
- Provides more direct service and improves transit reliability between major destinations within the corridor;
- Reduces traffic congestion;
- Improves overall air quality;
- Is compatible with other transportation projects already underway or under consideration in the Salt Lake region;
- Is compatible with the regional Transportation Improvement Plan (TIP) and Salt Lake City Transportation Master Plan;
- Assures environmental, community and aesthetic compatibility with surrounding areas; and
- Supports development of a multi-modal transportation system that is:
  - Convenient and accessible to people with a wide variety of needs;
  - Flexible enough to increase capacity for short periods of intense travel demand; and
  - Flexible enough to extend service to new areas of need as they develop.

## 1.3 CORRIDOR SETTING

### Boundaries and Physical Features

For the MIS/DEIS study, the West-East Corridor boundaries defined a broad area reaching from the airport and the International Center on the west to the entire University of Utah campus on the east, including the Research Park. The north and south boundaries of the West-East Corridor project study area were generally 600 North and 600 South respectively. For the West-East LRT Final Environmental Impact Statement (FEIS), the study boundaries were focused on the blocks adjacent to the LRT alignment since the LRT system is the preferred alternative. The LRT alignment (starting from the west end of the corridor) runs along airport access roads to North Temple at 2500 West; then North Temple to 400 West; 400 West to 400 South; 400 South to 1000

East; 500 South to just east of University Avenue, to 400 South along the west side of the Rice-Eccles Stadium parking lot, then east along South Campus Drive in the University of Utah campus; then north on Wasatch Boulevard and Medical Drive to the eastern terminus at the Health Sciences Center.

Due to the constraints of the mountains on the east and the lake and mountains on the west, development along the Wasatch Front has necessarily spread to the north and south. The West-East Corridor transects a wide swath of this longer north-south corridor as can be seen in the regional map in Figure 1.3-1. The details of the study corridor boundaries are found in the West-East corridor map in Figure 1.3-2. Generally, the FEIS study area extends from the SLCIA on the far west, through the downtown to the University of Utah campus on the eastern edge of Salt Lake City.

The physical features of the West-East Corridor are varied. The general corridor stretches from near the shore and associated wetlands of the Great Salt Lake near the airport on the west edge of the corridor, through the urban landscape of downtown, to the foothills and mountains on the east. The corridor is traversed by several creeks and waterways and includes some wetlands near the airport. Other natural features are present, including the Jordan River on North Temple and Red Butte Creek on the east end of the foothills area. A full description of the affected environment is presented in Section 3. A detailed evaluation of the environmental impacts is in Section 5.

## 1.4 PLANNING CONTEXT

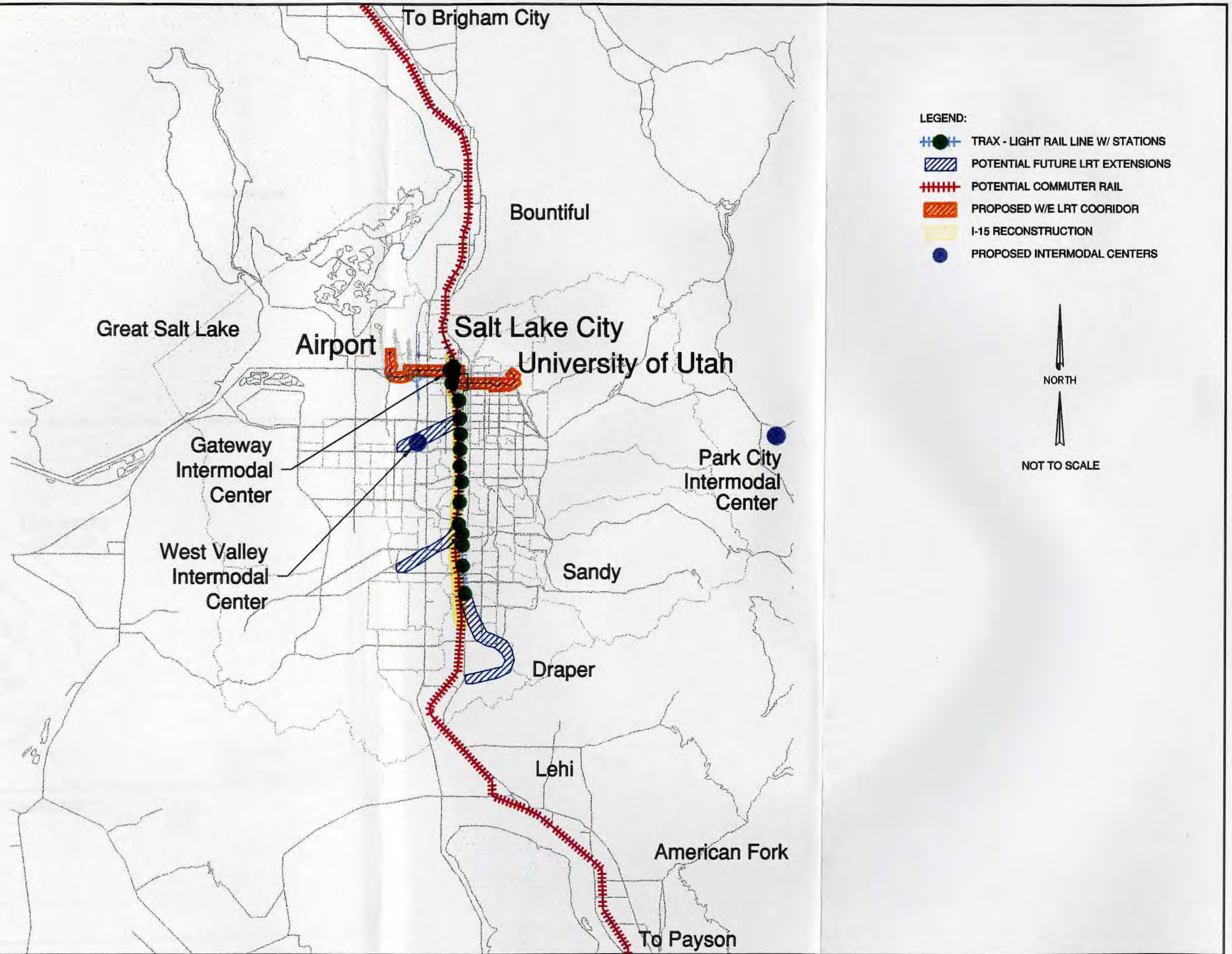
### 1.4.1 Role of Past, Current, and Future Studies

Several recent studies have identified transportation improvements within or affecting the West-East Corridor. The West-East LRT line is compatible with all the transportation plans, projects and studies mentioned in this section. The following is a brief summary of the most pertinent planning efforts.

In its **Long Range Transportation Plan for the Salt Lake Area**, the WFRC identified the West-East Corridor as a corridor for major transportation investments. Locations along this corridor boast the highest employment densities in the Salt Lake metropolitan area. This document recommends an LRT system be constructed along the West-East Corridor as part of a region-wide plan to reduce traffic congestion. As the region grows in the future, travel in the corridor will increase. While the Long Range Plan does identify this as a corridor for future major transit investments, physical and other constraints will limit major roadway improvements during the next 20 years. Traffic capacities will improve slightly, while demands will continue to escalate.

Integration with the **Long Range Transportation Plan and Statewide Transportation Improvements Plan (STIP)** is a critical aspect of the West-East FEIS. During the MIS/DEIS planning phase, the WFRC's 20-year Long Range Transportation Plan identified the corridor for substantial investments in transit improvements. Now that the MIS/DEIS study is complete, the Long Range Transportation Plan has been amended to include the West-East LRT system.

The **Long Range Transit Plan for the Salt Lake and Ogden areas** is aimed at developing recommendations for future bus service, identifying corridors for future major transit investment and



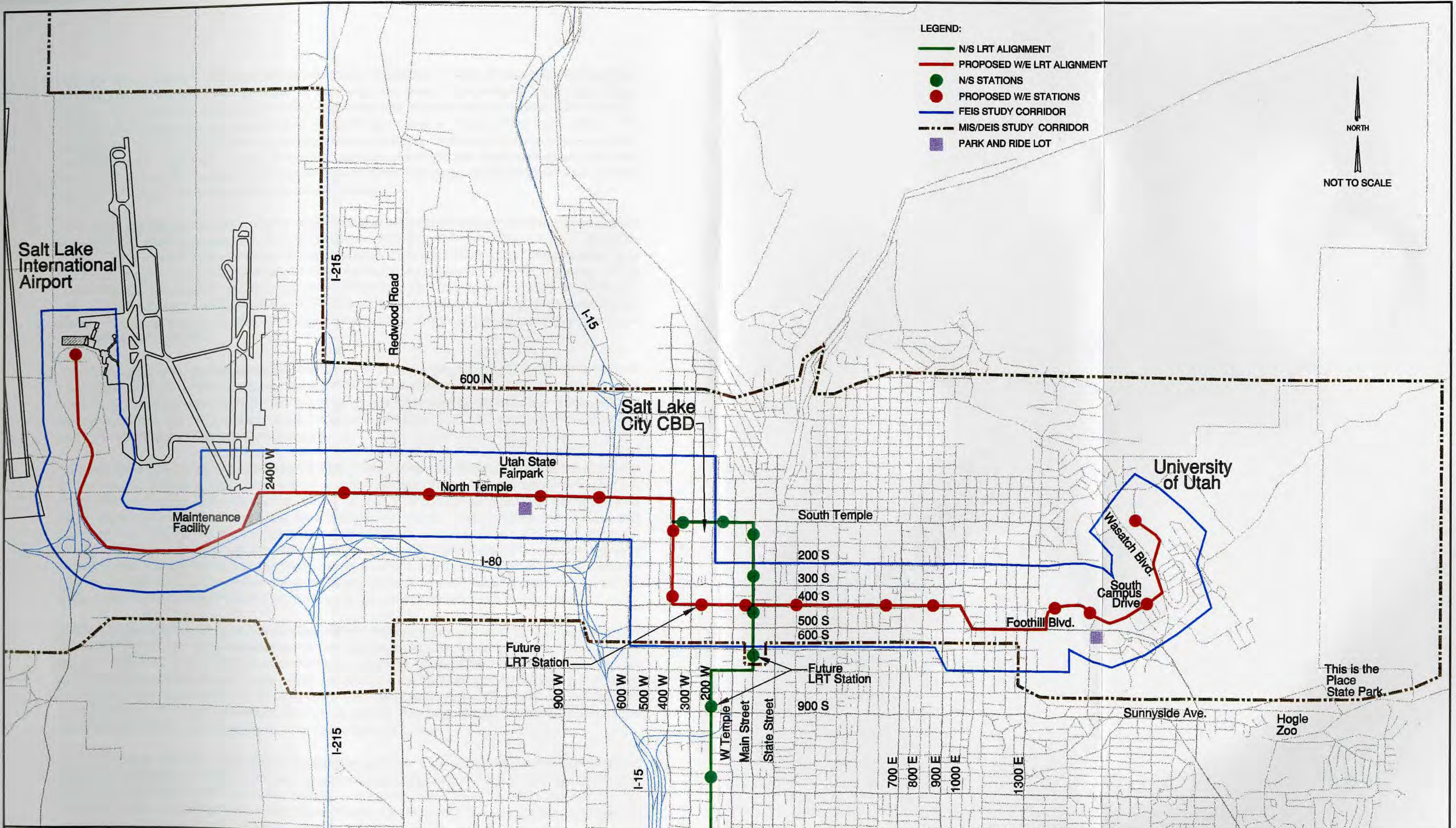

UTA TRAX TRANSIT EXPRESS

WASATCH FRONT REGIONAL COUNCIL
420 West 1500 South, Suite 200
Bountiful, Utah 84010

PARSONS TRANSPORTATION GROUP
DE LEUW, CATHER & COMPANY

West-East Corridor FEIS
Transportation Improvements

Figure 1.3-1

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West-East Corridor FEIS
Study Corridor

Figure 1.3-2

Study Corridor

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recommending ways to meet inter-city transit needs. Completed in 1996, the analysis recommends a higher level of investment in transit in the Salt Lake area. The analysis found that transit investment is effective in terms of mobility improvements and the most consistent with the long-term goal of implementing transportation improvements over a 20-year planning horizon. The analysis identifies the West-East Airport-Downtown-University Corridor as the most likely area for possible major investment, as the downtown and the University are, respectively, the first and second largest activity centers in Salt Lake County when ranked by combined total trips and trip density. The airport is the third largest activity center.

The **I-15/State Street Corridor Study and Final Environmental Impact Statement** evaluated highway and transit alternatives in the corridor from downtown Salt Lake City to Sandy. A North-South LRT system along the Union Pacific right-of-way from 10000 South to downtown was identified as the preferred transit alternative. Highway improvements include widening I-15 to accommodate one additional traffic lane, an HOV lane and an auxiliary lane in each direction. All interchanges between 10600 South and 500 North will be reconstructed. An Environmental Impact Statement was prepared and final design and construction is underway for both I-15 improvements and the North-South LRT.

The **Salt Lake City Transportation Master Plan** outlines the City's goals for all modes of transportation and recommends corridors for future improvements. The city council adopted policies which emphasize transit over highway as the best way to upgrade the transportation system. On May 12, 1998, the city council approved the West-East LRT alignment on 400 West and 400 South through the downtown area.

The **Salt Lake City International Airport Master Plan** defines the future of physical development at the airport, including transportation. The Airport Master Plan is based on an entirely new configuration of terminal facilities at the airport. A new central terminal building is being planned with a north-south underground people mover that will connect the west and east concourses and the terminal building. Traffic related to passenger arrivals and departures will be on separate levels. Pedestrian bridges will provide connections to a new transportation center and parking structure south of the airport access roadway. Provision is being made in plans for the roadway access system and transportation center to accommodate an LRT line and station. The transit station would have a direct walking connection to the central terminal and concourses.

The **Salt Lake City Intermodal Site Environmental Assessment**, prepared by Salt Lake City and published on May 14, 1998, identifies the future location of the Intermodal Center at the southwest corner of 200 South and 600 West in Salt Lake City's Gateway Area. The study provides an environmental assessment of the site which would house the facilities serving Amtrak, Greyhound, UTA buses and possibly future LRT and commuter rail passengers. If the Intermodal Center is constructed, a LRT spur line would also be constructed as part of that project to connect the Intermodal Center to the North-South and West-East LRT lines.

The **University of Utah Long Range Development Plan**, adopted by the University's Board of Regents, in December of 1997, outlines the preferred transportation alternatives in and around the University, including automobile traffic, parking, and transit. The West-East LRT alignment on the University campus is consistent with the Long Range Development Plan, and the plan's intent to provide alternatives to the automobile for accessing the campus.

The **University of Utah Transit Corridor Study** evaluated various transit options and alternative alignments for improving service between downtown Salt Lake City and the University of Utah. An extension of the proposed I-15/State Street corridor LRT line was one of the feasible alternatives identified for further evaluation.

### Current and Future Studies

The **Gateway District Land Use and Development Master Plan** is focused on development strategies for the Gateway area with the removal of certain rail lines as proposed in the Gateway Area Railroad Consolidation Study, published on February 16, 1996, and the shortening of the major freeway viaducts. The Railroad Consolidation Study made a recommendation for the location of a future commuter rail and light rail intermodal facilities. The Gateway District Land Use and Development Master Plan recommends land uses and development patterns, residential densities and urban design guidelines. The draft Gateway District Land Use and Development Plan was completed in April, 1998 and adopted by the Salt Lake City Council on August 11, 1998.

The **Commuter Rail Feasibility Study** evaluated the feasibility of a commuter rail line from Brigham City to Payson. The line would use existing freight rail right-of-way to distribute AM and PM peak hour commuters from the Ogden, Salt Lake and Provo areas. The study results show that the operational success of the Regional Commuter Rail system depends in some part on the accessability of west-east transportations systems at destination stations. A major investment study is proposed for the commuter rail corridor.

**West Valley City** is currently undertaking a Major Investment Study to examine transportation alternatives in the West Valley City (WVC) corridor, as well as the location of an intermodal facility. WVC is the location of the Ice Arena to be used for the 2002 Winter Olympics; it will be necessary to provide a reliable system which ties into the regional transportation system.

The **North I-15 Major Investment Study** is currently evaluating the need for transportation improvements on I-15 in Davis County. In addition, the **West Davis Highway MIS** evaluated alternatives for a highway facility parallel to I-15, also in Davis County.

**Interstate 80 Reconstruction** is currently underway at the mouth of Parley's Canyon. Further reconstruction is planned from the I-15 Interchange eastward.

There are several future studies proposed in the Salt Lake Region. WFRC has undertaken preliminary transportation feasibility studies in the Sandy, Draper and West Jordan corridors. These studies are evaluating the potential for implementing improved transportation service in each of these corridors.

## 1.5 TRANSPORTATION GOALS AND OBJECTIVES

The West-East Steering Committee, comprised of WFRC, UTA, UDOT, FAA, FTA, FHWA, SLCIA and Salt Lake City, reviewed and approved the following transportation goals and objectives for the corridor. These goals and issues have been supplemented with public comments. The Locally Preferred Alternative, the West-East Light Rail project system, achieves these goals.

**Provide a Transportation System That Is Efficient, Safe and Economical**
To serve these basic goals, the transportation system must minimize congestion and accidents and reduce travel time and pedestrian conflicts. Accomplishing these objectives requires providing adequate roadway capacity to accommodate demand, combined with efforts to reduce demand for that capacity. This will increase traffic flow, reducing accidents and travel time. This goal will also need to take into account expense and effectiveness of the system in getting people from one place to another and the increased traffic levels already being experienced in some residential areas, as well as the major highways and arterials.

**Provide a Transportation System with Minimal Impact on Environmental, Sociological and Aesthetic Values**
A primary concern associated with this goal is that the project identify a way to transport people quickly and efficiently without sacrificing air or water quality and without noise disturbance. This goal also looks toward preserving the views and vistas for which Salt Lake City is known and minimizing business and residential dislocations, community disruption or division and property damage. Thus, the mode chosen for a particular route must be sensitive to the features that might border—now or in the future—the alignment of that route, such as type of land use (residential, commercial, or industrial) and impacts the mode may have on neighboring water sources, wetlands, or wildlife.

**Provide a Balanced and Well-Coordinated Transportation System**
A successful transportation system consists of many elements, but in order to be effective, these elements must be well-managed and carefully coordinated to complement one another. Therefore, it is essential to coordinate the development of all elements of both the highway system and other public and private transportation services, as well as the links between them. This must be done in a way that will meet present and future travel needs in the corridor and the region. Another important aspect of a well-balanced system is its convenience for all users, including those with special needs. A system that is not easy to use will not fully serve its intended functions. The system must also provide an equitable distribution of transportation modes, facilities and benefits to permit all geographic, economic and social groups to participate effectively in essential urban activities. Finally, an effective system must balance the need for speed and reduced travel time against the benefits of frequent access points.

**Develop Programs That Will Encourage Changes in Travel Habits**
Much of the current strain on the area's transportation system is caused by travel and behavioral patterns. Therefore, the effective capacity of a highway may be increased not only by adding lanes, but also by shifting some of the peak demand to times of day when that route is less congested. Thus, any successful transportation solution must include TDM programs that will seek to reduce peak demand by spreading it over longer time periods. Changes in travel habits can also reduce demand by shifting it to other modes and simply decreasing it when fewer people travel or travel alone. Tele-commuting and trip consolidation should be encouraged as well.

**Develop a System That Is Flexible in Capacity**
Capacity flexibility is important in a system that needs to accommodate isolated periods of increased demand. The corridor contains a number of facilities that generate intense, short bursts of travel demand when they host special events, such as concerts, sporting events, or large meetings. The airport also has short periods when it generates more traffic than usual during high

travel seasons. Thus, a successful system must be able to adapt to accommodate these brief times of high travel demand and do so at a reasonable cost. The system must also be flexible enough to accommodate changing needs over the longer term. Travel demand will undoubtedly change in the region as new residential areas are developed and new employers appear. The system must have the capability to extend into new areas to serve the needs generated by new developments.

## 1.6 PROJECT RATIONALE AND STRATEGY

A LRT system with TDM/TSM features is recommended as the locally preferred alternative for the West-East Corridor for the reasons outlined in this section. The rationale and strategy for the West-East Light Rail project alternative is highlighted as follows. The West-East Light Rail project system is recommended because LRT:

- Is a vital west-east link in the region's Long Range Transportation Plan;
- Is consistent with recommendations of the Long Range Transit Analysis;
- Offers a logical west-east extension to complement the North-South LRT line;
- Has higher capacity to accommodate increasing transit passenger volumes resulting from the following conditions:
  - increasing population and employment in the downtown area;
  - extension of LRT into other corridors;
  - implementation of commuter rail service;
  - growth in travel demand at special generators (such as, Airport, Convention Center, Temple Square, LDS Assembly Building, University);
- Has short-term higher capital cost compared to bus, but those are offset by lower O&M cost per passenger for LRT in the long term; particularly if commuter rail is initiated and additional LRT corridors are implemented;
- Has higher passenger capacity per unit:
  - 150 passengers, compared with 55 per bus;
  - 500 passengers per train, 4-train unit;
- Reduces number of vehicles on downtown streets (compare two-car LRT with 10 buses);
- Emits none of the air pollutants that buses do and generally improves the region's air quality;
- Is more attractive to potential transit passengers. Experience in other cities with an LRT systems has shown that many people who are uncomfortable riding a bus are riding LRT;

- Offers better intermodal service/penetration for the Airport and University;

- Can provide significantly higher capacity for special event service:

  - with minimal increase in operating costs;
  - with lower impact on event traffic congestion; and

- Supports SLC Master Plan and assists in directing land use and development; and

- LRT runs on a more reliable schedule than buses, particularly in an increasingly traffic congested area.

The benefits of LRT as outlined in Section 1, will offer optimal transportation service for the West-East Corridor, especially when combined with TSM and TDM actions.

# SECTION 2
# ALTERNATIVES CONSIDERED, INCLUDING PROPOSED ACTION

## 2.1 INTRODUCTION: PROPOSED ACTION

The proposed action, the West-East Light Rail project, a two-directional LRT line, will be constructed to serve the 10.9 mile corridor by beginning at the Salt Lake City International Airport (SLCIA), extending through downtown Salt Lake City, to the University of Utah Health Sciences Center (see Figure 1.3-2). The western terminus is proposed to connect with the planned SLCIA transportation center. The LRT alignment crosses the airport property on a partially elevated guideway. It then departs the airport property at the existing west-bound I-80 access roadway, to run along I-80 south of the airport golf course to 2500 West. From 2500 West, the alignment heads north about one block to North Temple. The LRT alignment then runs down the middle of North Temple to the east until 400 West, where it turns south. The LRT alignment runs down the middle of 400 West to 400 South where it travels east through downtown to 1300 East. On 400 South between 400 West and 200 East, the LRT system will be single track alignment on each side of the street. East of 200 East, the LRT alignment will transition back to the middle of the street. At 1000 East, the LRT alignment follows the roadway over to 500 South as it goes up a steeply graded hill. Just east of University Avenue (east of 1300 East), the LRT alignment enters the campus of the University of Utah along the west side of the Rice-Eccles Stadium parking lot. The LRT alignment then turns east on 400 South and then follows South Campus Drive along the north side of the street, past the stadium and Huntsman Center to Wasatch Boulevard. The LRT alignment then turns north and runs along the east side of Wasatch Boulevard and Medical Drive to the north until the eastern terminus at the University's Health Sciences Center. Fifteen initial LRT stations are proposed throughout the route, including two end terminal stations. The West-East LRT will interface with the North-South LRT at Main Street and 400 South, and at 400 West and South Temple, where a passenger transfer between lines will be possible. A park and ride lot is planned along North Temple near the Utah State Fairpark. The State Fairpark is currently developing site plans for the area. When the development occurs, a shared parking structure will be incorporated into the site design to serve as a parking facility for both Fairpark and LRT patrons. A second park and ride lot is planned at an existing parking lot on the University of Utah campus.

## 2.2 SCREENING AND SELECTION PROCESS

The MIS/DEIS process was designed to narrow a wide range of transportation technologies, strategies and modes to a locally preferred alternative (LPA) that effectively and adequately addresses specific corridor transportation problems while ensuring that environmental and other factors are considered. The first task of the MIS/DEIS for the Airport-to-University West-East Light Rail Project was to define a wide range of conceptual alternatives. This wide range of alternatives was then screened to select a final set of three alternatives for more detailed analysis and evaluation. Documented in this section are the actions that were taken, the steps that were followed and the results obtained which provided a basis for selecting three alternatives for more detailed evaluation. The resulting three alternatives were described in Section 2.5 of the MIS/DEIS, "Description of DEIS Alternatives." The analysis and evaluation of these three alternatives were documented in Sections 4, 5, and 6 of the MIS/DEIS. Section 7 of the MIS/DEIS discussed the comparative benefits and costs of the three alternatives and presented a recommended LPA for implementation in the Airport to University West-East Light Rail Project.

**Criteria for Evaluation**

At each step in the process, alternatives were evaluated for financial, transportation and environmental impacts, by weighing them against the five measures listed below. As the alternatives became more refined, the level of analysis also became more rigorous and detailed.

1. **Cost Effectiveness: Financial Analysis and Evaluation**
   In order to gain support and approval for implementation, an alternative transportation system must be achievable in terms of financial resources for both the initial capital investment and the ongoing operations and maintenance costs. It must also be cost effective in terms of positive and reasonable results in relation to the investment.

2. **Mobility Improvements**
   Evaluation of mobility improvements in relation to a specific transportation alternative analyzes how well travelers and others are able to travel throughout the study area to participate in their desired activities. The criteria for this measure include savings in travel times, number of users on the highway system and level of ridership on the transit system.

3. **Operating Efficiencies**
   Measurement of operating efficiencies involves the evaluation of the following criteria: roadway/intersection level of service; vehicle-miles traveled; hours and miles of bus and LRT operation; parking requirements; and intermodal system integration.

4. **Environmental Benefits and Impacts**
   Environmental benefits and impacts occur on both the natural and the man-made world. Alternatives were weighed against the consequences to air quality; water resources; contaminant sources; wetlands and wildlife; floodplains; threatened and endangered species; minerals and vegetation; as well as social and economic characteristics of the corridor, including environmental justice.

5. **Support of Existing Land Use Policies and Future Patterns**
   Analysis of current and future land use impacts to ensure sensitivity and support for existing land use in the study area includes consideration of speed; noise and vibration; visual impacts to neighborhoods; attractiveness to visitors; as well as image and aesthetic values.

**Alternatives Development Process**

In narrowing the alternatives for the corridor, there were three stages of evaluation. The first stage considered a wide range of conceptual alternatives. Some of the conceptual alternatives were eliminated and others were organized into Conceptual Alternative Groups. The next stage was to formulate and evaluate alignment options for each Conceptual Alternative Group. A preferred alignment was identified for each group which, in effect, optimized the performance of that alternative group. Each optimized alternative group was then described as one of the three alternatives for more detailed evaluation in accordance with MIS/DEIS procedural guidelines. The details of each stage are discussed in the following sections.

### 2.2.1 Conceptual Alternatives Considered in the Major Investment Study

Conceptual alternative is the term used to describe a broad range of potential transportation improvements. Conceptual alternatives are not specific projects as much as general categories of possible strategies and technologies. The categories initially considered in the West-East MIS/DEIS study process are listed below:

**No-Build** is a baseline alternative required by the National Environmental Protection Act to ensure evaluation of a reasonable range of alternatives. It must be carried through the entire evaluation process from conceptual to detailed alternative. The No-Build Alternative requires evaluation of all transportation systems currently existing, as well as those which are not yet in place but are included in adopted local/regional plans and for which specific funding has been authorized. The purpose is to determine what the impacts will be if no action is taken or no project is built.

**Transportation System Management (TSM)** incorporates management of existing infrastructure with improvements such as one-way streets, reversible lanes that accommodate the AM and PM rush hour by designating added lanes to flow in the direction of demand, traffic signals adjusted to respond to traffic-volume demands, intersection turn-lane expansion, and bus pull-outs.

**Transportation Demand Management (TDM)** is a group of strategies aimed at reducing peak-hour and overall travel through telecommuting, variable work hours/days, employer-based programs, bicycle and pedestrian enhancements and car/vanpooling programs.

**Intelligent Transportation Systems (ITS)** is the use of electronic communication and management of travel information such as integrated signal control, signal-timing adjustments based on changing traffic volumes, driver and transit user information and incident management.

**Bus and HOV Improvements** combine additional local buses and corridor shuttles with high-occupancy vehicle lanes/exclusive-use bus lanes.

**Roadways** involves expanding the number of through lanes available on existing roads and at intersections. Limits on widening roadways tend to decrease with distance from the urban core, since right-of-way availability goes up as densities go down.

**Light Rail Transit System (LRT)** is a transit technology that operates with steel wheels on steel rails and is propelled by rotary electric motors. Power is obtained from overhead wires. It operates in its own right-of-way or in mixed traffic, with station spacing of one mile or more. Because LRT can operate as a single vehicle and can also be coupled in trains up to six units in length, the capacities can exceed conventional bus systems.

**Fixed-Guideway Transit (FGT)** is a transit system that operates on its own separate guideway; vehicles cannot mix with motor traffic. Station spacing is variable and requires vertical transportation (elevators) to access the elevated or underground stations. It can be operated either manually or by automatic control. This category includes people-movers and monorail.

**Commuter Rail** runs on conventional railroad tracks and is mostly used for long-distance commuter trips. Stations are spaced at least 2-3 miles apart. Vehicles can cross streets and highways but trains cannot operate in mixed traffic because of high operating speeds.

### 2.2.2 Screening of Conceptual Alternatives

Initially, the preceding nine conceptual alternatives were screened by the West-East Steering Committee and the study team. Evaluated for cost effectiveness, mobility improvements, operating efficiencies, environmental benefits and impacts, and policies in support of current and future land use, the initial nine conceptual alternatives were narrowed to those suitable for the corridor. The process required evaluating each alternative against the preliminary criteria and giving a score (good, fair, poor) for how well each conceptual alternative would perform in relation to each of the criteria. These scores were then tabulated and averaged to provide an aggregate score for all.

**Conceptual Alternatives Eliminated**

Based on input from the scoping meeting, discussions with the Steering Committee, and identification of fatal flaws, the following conceptual alternatives were eliminated in this screening process:

**Roadways**

This alternative would involve major expansion of roadway capacity by increasing the number of through lanes on major streets and highways. Numerous roadway improvement projects, including reconstruction of I-15, are upgrading and expanding the roadway capacity and operating efficiently in the corridor on north-south streets and highways. For the West-East street system the roadways east of I-15 are the only area where addition of traffic lanes might be considered. However, as this portion of the corridor is primarily urban in land use, the availability of land for new or expanded roads is very limited. A roadway alternative for the corridor was therefore eliminated because of the adverse impact involved in taking right-of-way to expand existing roadways or construct new ones.

**Fixed-Guideway Transit (FGT)**

Fixed-guideway transit systems, such as people-movers or monorail, were eliminated because of the high cost of constructing grade-separated guideways and stations, (either elevated or underground). Due to the short length of the study corridor, possible reductions in travel time were not significant enough to justify the high capital cost expenditure. Concerns about impacts to the visual and aesthetic characteristics of the corridor were factors in the exclusion of elevated FGT. Underground systems (subways) were discarded because they are even more costly, due to the expense incurred in moving utilities and excavating the underground right-of-way required.

**Commuter Rail**

Commuter rail was eliminated because it does not serve the type of transit trip desired in the corridor, and due to the lack of available right-of-way in the corridor. Commuter rail generally serves trips longer than 20 miles. The West-East Corridor is only 10.9 miles long, and the average trip length is even less. For this reason, commuter rail would not serve the corridor well. Also, commuter trains run on the same kind of tracks as freight rail, reaching speeds up to 90 miles per hour, thus are unable to mix with auto or pedestrian traffic. This technology clearly would not fit into the study corridor's urban and residential environments, since it is designed to run long distances between stops, rather than stopping frequently. Hence, commuter rail was eliminated as an alternative because of it's inability to provide frequent stops in the corridor to provide access and transfers to riders, or to mix with traffic.

### Conceptual Alternative Groups Selected for Further Evaluation

The remaining conceptual alternatives were not eliminated. They were combined into two groups of technologies and strategies, plus a No-Build Alternative. This grouping was made because, although each of the remaining individual conceptual alternatives had merit, no single alternative offered a solution to the multiple transportation problems associated with the study corridor. However, when combined together, they would provide the most comprehensive transportation service possible along the corridor. These conceptual alternative groups are described below.

#### Conceptual Alternative Group A—No-Build

As mentioned above, Alternative A—No-Build is a baseline alternative required by the National Environmental Protection Act to ensure evaluation of a reasonable range of alternatives. It must be carried through the entire evaluation process from conceptual to detailed alternative. The No-Build Alternative includes all transportation systems currently existing, as well as those which are not yet in place but have been committed to and are currently underway. Two such projects, unconstructed but committed, were assumed for the purpose of this study. It was assumed I-15 will be reconstructed and the North-South LRT line will be built and put into operation. In addition, traffic signals in the corridor would be synchronized by the ITS program currently in the initial stages of implementation.

In addition, the No-Build Alternative includes the planned railroad consolidation project in the Gateway district, which anticipates the relocation of the railroad yards currently existing between 400 West and 500 West. Construction of an Intermodal Center at 600 West 200 South is planned to accommodate the relocated Amtrak Station, as well as the relocated Greyhound bus station. There is some uncertainty about the completion date of the railroad consolidation project and Intermodal Center, but they were still considered part of the No-Build Alternative because the probability of completion is high.

#### Conceptual Alternative Group B—Bus/HOV Combined with TSM and TDM

This group of conceptual technologies and strategies focuses on expanded bus service in the corridor, combined with High-Occupancy Vehicle lanes (HOV), Intelligent Transportation Systems (ITS) technologies and Transportation System Management (TSM)/Travel Demand Management (TDM) strategies. Bus service would be expanded to offer express buses throughout the corridor, including increased service to Salt Lake City International Airport and the University of Utah, as well as increased frequencies on existing routes during the peak AM and PM travel hours. High-Occupancy Vehicle lanes would be created on existing roadways with signs and pavement markings, exclusively for the use of buses and vehicles carrying two or more passengers during the peak hours. TSM strategies, such as increasing the number of turn lanes, would be used at congested intersections to increase the level of service and allow cars to travel through the intersection more efficiently. Large employers and other activity centers currently generating a significant amount of traffic would be encouraged to use TDM strategies to reduce the number of trips made by their employees and customers. TDM strategies could include, but not be limited to, subsidizing the use of transit through pass programs, reducing/limiting the availability of parking or increasing the cost, encouraging employees to work flexible (non-peak) hours and to telecommute from their homes.

**Conceptual Alternative Group C—LRT combined with TSM and TDM**
This group of conceptual technologies and strategies focuses on the implementation of a light rail transit line in the corridor between the University of Utah, downtown Salt Lake City and Salt Lake City International Airport. It also includes Transportation System Management (TSM) and Travel Demand Management (TDM) strategies. TSM strategies, such as increasing the number of turn lanes, would be used at congested intersections to increase the level of service and allow cars to travel through the intersection more efficiently. Major employers and other activity centers currently generating a large amount of traffic would be encouraged to use TDM strategies to reduce the number of trips made by their employees and customers. TDM strategies would include but not be limited to subsidizing the use of transit through discount pass programs, reducing/limiting the availability of parking or increasing the cost, and encouraging employees to work flexible (non-peak) hours and to telecommute from their homes.

### 2.2.3 Screening of Alternatives and Alignment

In order to choose an appropriate alignment for each selected group of conceptual alternatives, it was necessary to define and evaluate a number of bus and LRT alignments. To simplify the evaluation of alignments, the corridor was divided into three subareas: the Western Corridor; the downtown; and the Eastern Corridor. One alignment option for the Eastern Corridor and two alignments for the Western Corridor were evaluated for Group B—Bus/HOV. Three Group C—LRT alignment options were evaluated for both the Eastern and Western Corridors. Several downtown alignment options were considered for the purpose of connecting the Western and Eastern Corridors.

The evaluation process for each of the bus and LRT alignments involved the gathering of pertinent information about the affected environment and anticipated impacts of each proposed alignment option. The information contained in the environmental analysis comprised the majority of the information presented to the public at the September 26, 1996 public meeting/open house. Public comment was taken at that meeting, as well as by written and telephone comments. The public preferences stated in the comments were considered a vital part of the decision-making process.

All West-East alignment options were evaluated against the same five measures used to evaluate the conceptual alternatives: cost effectiveness; mobility improvements; operating efficiencies; environmental benefits and impacts; and support of existing land use policies and future patterns.

In the screening of the Western and Eastern Corridor alignment options, information on operations and maintenance costs, capital costs, travel times, traffic impacts, environmental impacts, and land use was compiled by the study team into a comparison chart included in the MIS/DEIS. This chart, showing the advantages and disadvantages of each alignment option, was submitted to the Steering Committee for review, along with the public comments to date. The committee selected preferred West-East alignment options based on this information.

It was assumed that the bus alignment would be the same as whatever LRT alignment was selected and approved. The 400/500 South route offers direct connections to the 400 South/I-15 interchange to be constructed as part of the I-15 improvements.

**Selection of Preferred West-East LRT Alignment Options**
North Temple between the airport and 600 West was selected as the preferred Western Corridor LRT alignment for a variety of reasons. It serves the highest commercial and employment densities in the Western Corridor. It offers the most direct route and therefore the fastest travel time for people passing through the corridor between downtown and the airport. It has the least impact on residential neighborhoods. It is the most compatible with the planned economic revitalization of North Temple. With regard to determining the North-South street to accommodate the LRT alignment it could not be decided whether to use 400 West or 600 West to connect to the downtown option. Hence, both streets were retained for incorporation into the downtown alignment option set for further evaluation.

A South Temple LRT alignment was considered during the screening process. The LRT alignment would generally follow the Salt Lake Garfield and Western (SLG & W) railroad right-of-way west from downtown to the airport. A Union Pacific (UP) railroad line also parallels the SLG & W tracks to the south in this general area of South Temple. The SLG & W railway is currently a short line railroad serving customers at the International Center and other businesses to the west of the airport. After analyzing this possible LRT alignment, it was eliminated from consideration for several reasons. The South Temple alignment would not effectively serve the ridership that is located in the businesses and State offices on North Temple. In addition, the South Temple area contains heavy industrial uses rather than commercial land uses found on North Temple. Pedestrian and bicyclist access would be difficult and certain segments of the right-of-way through this area are no longer available.

The 400/500 South alignment was selected between downtown and the University of Utah primarily because it is the most compatible with adjacent land uses and development. Access to adjacent properties would essentially be unchanged with this alignment because the existing median in 400/500 South already precludes left turns except at intersections. The 400/500 South alignment is supported by neighborhoods because it is a street already functioning as a major transportation corridor. Also, this alignment offers an acceptable route to traverse the steep grades near 1000 East.

**Screening of Downtown Alignment Options**
In screening the downtown alignment options, a deeper level of detail was required than had been previously performed on the West-East Corridor alignment options, due to the additional conflicts of downtown traffic and congestion, the North-South LRT line operations, and critical parking and access issues. An initial screening was conducted to eliminate any of the downtown alignment options that were considered to have a fatal flaw that would make further evaluation inappropriate.

After several downtown alignment options were eliminated, the remaining five downtown alignment options were subjected to a detailed analysis and evaluation that focused on the following issues: (1) intersection level of service; (2) preservation of on-street parking; (3) preservation of auto access to properties; (4) population and employment within walking distance of stations; (5) visual impact and aesthetics; (6) historical and cultural resources; (7) other environmental issues; (8) compatibility with land use plans; and (9) compatibility with the North-South LRT line and bus operations.

The downtown alignment option selected was North Temple to 400 West to 400 South. This alignment option was retained as the preferred option on the basis of mobility improvements, operating efficiencies and land use policy support. This alignment option services both existing densities along 400 South, and the future densities anticipated to come with the redevelopment of the Gateway area. If the decision is made to reconstruct the viaduct on North Temple to accommodate LRT, there is an opportunity to incorporate pedestrian and bicycle enhancements into the design of the new viaduct to facilitate connections between the east and west portions of the corridor. This alignment has the potential to more fully define the southern boundary of downtown and capture the new riders who are under-served by potential alignments further north. In addition, 400 South to 400 West requires only two turns in the downtown area, thereby reducing travel times throughout the corridor. Finally, 400 South offers good access to the new Scott M. Matheson Court complex and the City/County Building.

## 2.3 DESCRIPTION OF THE DRAFT ENVIRONMENTAL IMPACT STATEMENT ALTERNATIVES

As explained in Section 2.2.2, initial conceptual alternatives were organized into three basic alternative groups. Alternative alignments were then defined and evaluated for each group. A preferred alignment was identified for the Bus/HOV alternatives and the LRT alternative system. By definition, no alignment was defined or evaluated for the No-Build alternative. The preferred alignment for the Bus/HOV and the LRT alternatives represent the optimum configuration of the transportation system for each respective alternative. The following sections present a detailed definition of each alternative evaluated in the MIS/DEIS.

### 2.3.1 Alternative A—No-Build

Alternative A is the "no-build" alternative required by NEPA. The No-Build Alternative is defined as "no-build" because it represents the condition and status of the transportation system in the West-East Corridor if no major investment is made to improve or change what currently exists or is already planned and committed. Relative to existing conditions in the corridor, Alternative A—No-Build clearly has major improvements that are already funded and in some stage of implementation. Several major elements of the West-East Corridor transportation system do not presently exist, but are included in the Alternative A—No-Build. They include the following improvements:

**Reconstruct I-15 from 600 North to 10800 South**

UDOT is in the process of undertaking a design/build project that will lead to the complete reconstruction of I-15 between 600 North and 10800 South. The project has an estimated cost of

$1.5 billion. Design and construction began in April, 1997 and is scheduled to be completed in the fall of 2001. The following provisions for access are of particular interest to the West-East Corridor:

- The existing freeway connections to I-15 at 500 South and 600 South are being reconstructed with connections moved to local streets further west at 500 West;
- General purpose lanes from the south on I-15 will exit to 900 South and 600 South. The return connections to the south are at 500 South and 900 South;
- Separate HOV lanes to and from the south are being constructed in I-15 starting at 400 South. HOV traffic will be able to access I-15 at the newly constructed 400 South interchange;
- A primary interchange from the north for general purpose traffic on I-15 will be at 600 North. This traffic will have intersection connections to 300 West and 400 West;
- General purpose traffic to and from the north on I-15 will also have an interchange at 400 South; and
- I-80 traffic to and from the west will have access to downtown via 600 South (inbound) and 500 South (outbound).

**North-South Light Rail Transit (LRT)**
UTA commenced construction early in 1997 on a 15-mile LRT line that extends from South Temple at 400 West through downtown to 10000 South in Sandy. The line approaches Downtown via 200 West to 700 South. It then transitions along 700 South to Main Street where it travels north to South Temple. It then turns west to 400 West. The line will be double tracked for two-way operation and situated in the center of the street along the route.

**UTA Bus Routes Coordinated with the North-South LRT**
UTA is in the process of modifying local and express bus routes so that they are consistent with eventual operation of the North-South line. This includes a downtown shuttle route using buses passing through downtown from the Avenues on the east side to the Rose Park area on the west side. Local bus routes running north-south on major streets east of downtown will enter and exit the downtown area via 200 South rather than the previous access along 400 South.

**Intelligent Transportation System (ITS)**
In coordination with Salt Lake City and other local jurisdictions throughout the Salt Lake Valley, UDOT is in the process of developing a management and communication system to integrate the operations of the area's freeway system and traffic signals at all intersections in the corridor. A traffic operations center will be completed in 1999 to provide a central location for management and control of this area-wide coordinated traffic-signal system. Other ITS elements will be implemented as part of the I-15 reconstruction and north-south LRT projects.

**Downtown Railroad Consolidation**
Construction is already under way to consolidate railroad operations on the west side of downtown Salt Lake City. A major benefit of this effort will be to eliminate many of the railroad tracks that

presently run in or cross existing streets. This creates the opportunity for redevelopment of the Gateway area and also makes it possible to shorten the viaducts serving downtown when they are rebuilt as part of the I-15 reconstruction project.

**Gateway Redevelopment**

Salt Lake City is currently in the process of defining possibilities and options for the redevelopment of the Gateway area on the west side of downtown. As part of Alternative A—No-Build, it was assumed that these improvements would be defined and initiated. The potential exists for the West-East LRT line to eventually connect with the proposed Gateway Intermodal Center once that facility is constructed.

**Salt Lake City International Airport (SLCIA) Master Plan**

A new master plan is being developed for the SLCIA. This plan includes the construction of a single airport terminal with west-east concourses north of the terminal connected by an air-side people-mover system. The transportation alternatives for the West-East Corridor would eventually interface with the airport through the single new terminal facility.

**Existing Arterial Street Cross Sections**

The existing arterial street cross sections represent the no-build condition of Alternative A. The cross sections are described below to establish a baseline for comparison with the revised cross section for Alternatives B and C.

The current cross section along 400/500 South within the West-East Corridor consists of six through lanes. Currently, parking is allowed on 400 South. North Temple consists of four to six through lanes depending on west-east location. Parking is restricted within the study area. The existing lane configurations of the proposed corridor are summarized in Table 2.3-1. Typical cross sections of 400 South and North Temple are included in Figure 2.3-1 and Figure 2.3-2.

All of the above improvements were either included or recognized as part of Alternative A—No-Build. Combined with existing elements of the West-East Corridor transportation system, they constitute the baseline condition in relation to the other DEIS alternatives. All of the improvements identified in Alternative A—No-Build, were incorporated and assumed in the baseline computer analysis network models. These improvements collectively represent the baseline condition against which the performance of the other DEIS alternatives were compared and evaluated.

**Table 2.3-1**
**Existing Lane Configurations**

| Street Name | From | To | Number of Through Lanes |
|---|---|---|---|
| North Temple | I-80 | 900 West | 6* |
| North Temple | 900 West | 400 West | 6 |
| 400 West | North Temple | 400 South | 4 |
| 400 South/500 South | 400 West | University Ave./500 South | 6 |
| Roadway east of University Ave. | 500 South | 400 South | 1 (one way) |
| South Campus Drive | University Avenue | Wasatch Drive | 4 |
| Wasatch Drive | South Campus Drive | South Medical Drive | 6 |
| South Medical Drive | Wasatch Drive | Terminus | 4 |

*Currently re-striped for 6 lanes during I-80 reconstruction.

### 2.3.2 Alternative B–Bus/HOV/TDM/TSM

This alternative focused primarily on providing improved west-east transportation service in the corridor using local and express bus routes. In addition to expanding and improving bus routes, this alternative would include actions related to travel demand management (TDM) and traffic system management (TSM).

**Increased Frequency of Bus Service**

In addition to consolidating local bus operations to utilize the bus/HOV lanes, additional buses would be operated to provide a higher level of bus transit service throughout the corridor. For purposes of comparing alternatives, it was assumed that a special bus route would be operated from the airport through downtown to the University of Utah with a bus every five minutes. This represents a major increase in bus service available today. Presently, there is not a bus route that extends the full length of the corridor. Furthermore, the existing bus routes typically operate with buses every 15 minutes to one hour rather than the five-minute headway assumed for this alternative.

**Bus/HOV Lanes**

One of the basic methods of decreasing the number of vehicles in a given corridor without reducing the number of trips is to encourage people to share trips. This can be accomplished in a number of ways. One of the most familiar is busing. Other methods include car and van pools. By providing lanes exclusively for vehicles with more than one occupant, more individuals are encouraged to share rides to gain access to these lanes which, as a rule, are less encumbered than their single occupancy counterparts. If the HOV lane becomes congested, the limiting number of occupants can be raised to encourage further reduction in vehicles.

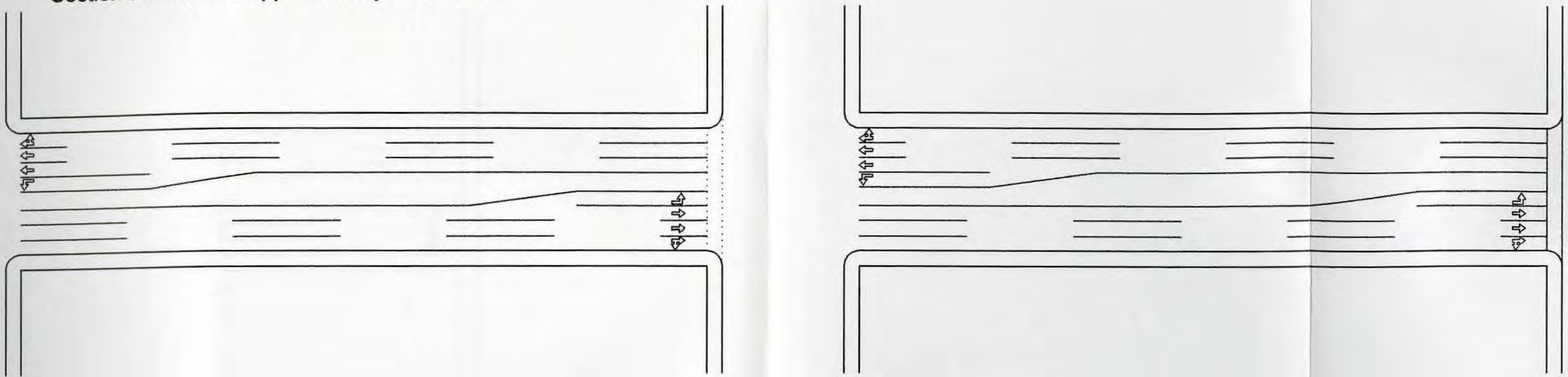
Under this alternative, a separate bus/HOV lane would be created in the lane nearest the curb for each direction of traffic flow on designated streets. The lane would be specially marked as a "diamond" lane for use by buses and HOV's during peak hours. In addition to special pavement marking, there would be overhead signs with lights and special signalization at intersections to facilitate the efficient flow of vehicles traveling in these lanes. The lanes would be available to buses, commercial vans and cars carrying two or more passengers.

For the east end of the corridor, the lanes would start at Foothill Boulevard to the south of the University of Utah. They would continue along 500 South to 1000 East where they would transition with the main roadway to 400 South. The lanes would continue along 400 South to 400 West where they would connect with the HOV lanes being constructed as part of the I-15 reconstruction project (see Figure 2.3-1).

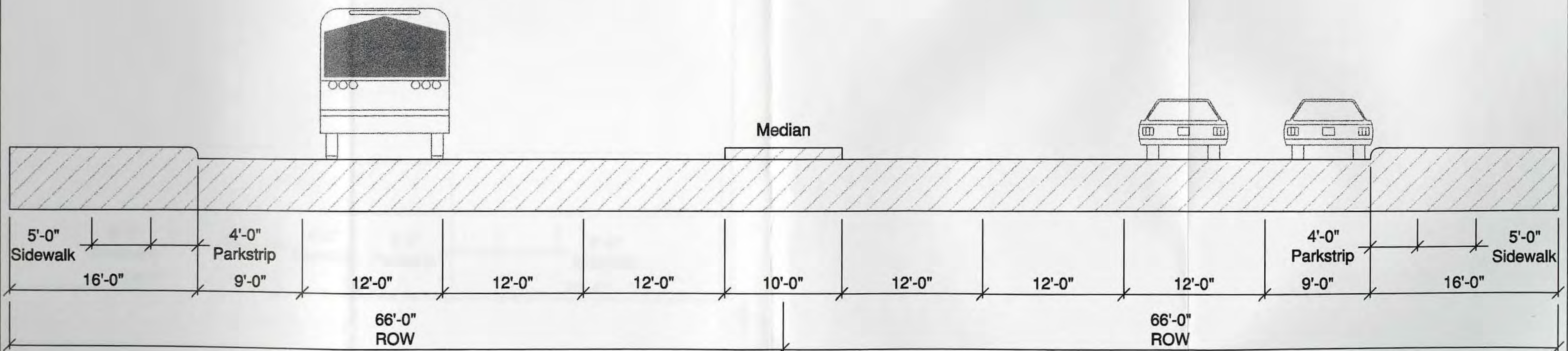
As part of Alternative B–Bus/HOV/TDM/TSM, the bus/HOV traffic would follow several alternative routes to continue north, west or south.

- Bus/HOV traffic could travel north on 400 West to North Temple. If the North Temple viaduct over the railroad is reconstructed after the railroad tracks are relocated, it would be shortened to provide for a direct connection to 400 West. At this point, the bus/HOV traffic would connect with general traffic on North Temple. If the existing North Temple viaduct

Note: Dimensions are approximate.
Not to scale. Lane widths, parkstrip, sidewalk, etc. varies throughout the corridor.
Section shown is for approximately 300 East.



Typical Block Site Plan

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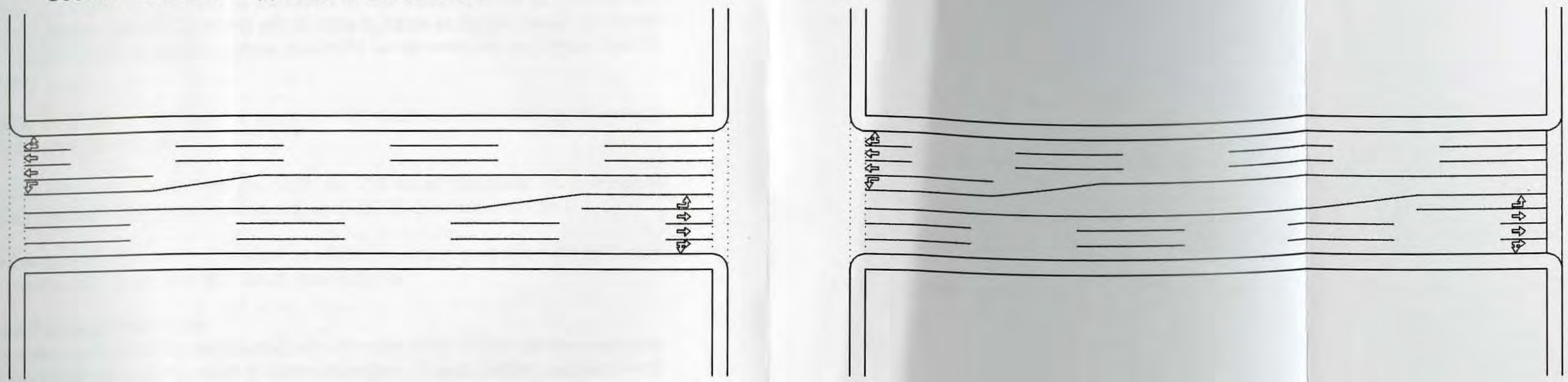
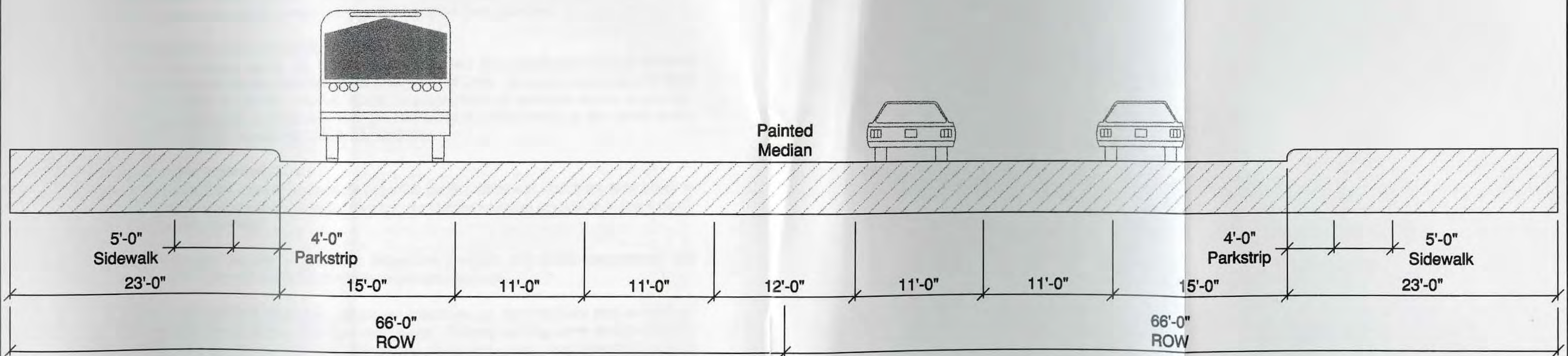
West-East Corridor FEIS
Existing Typical Cross Section-400 South

Figure 2.3-1

Note: Dimensions are approximate.
Not to scale. Lane widths, parkstrip, sidewalk, etc. varies throughout the corridor.
Section shown is for approximately 600 West.



Typical Block Site Plan

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West-East Corridor FEIS
Existing Typical Cross Section-North Temple

Figure 2.3-2

Existing Typical Cross Section-North Temple

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remains, bus/HOV traffic would need to transition to 300 West in order to connect with North Temple. Because bus/HOV traffic will be able to travel at higher speed along I-80 between downtown and the airport, special bus/HOV lanes were not recommended for North Temple;

- Bus/HOV traffic traveling to and from the south on I-15 would connect with the freeway at the new 400 South interchange;

- Bus/HOV traffic traveling to and from the north on I-15 would transition on north/south streets and connect with 500 South (outbound) and 600 South (inbound); and

- Bus/HOV traffic traveling to and from the west on I-80 to the airport and International Center would also use the 500 South and 600 South connections.

**Transit Centers and Park-and-Ride Lots**
In conjunction with the buses and HOV lanes included with this alternative, transit centers and park-and-ride lots would be constructed at key points of transit interface. Transit centers and park-and-ride lots would be constructed at the following locations:

- Utah State Fairpark
  Bus bays would be constructed on both sides of North Temple at the State Fairpark. Bus bays would be provided for passengers to transfer between buses or load/unload for activities at the State Fairpark. Arrangements would be negotiated with the State Fairpark to utilize available parking when not needed for State Fair activities.

- Rice-Eccles Stadium—University of Utah
  Special bus lanes would be constructed to access bus loading/unloading facilities surrounding Rice-Eccles Stadium at the University of Utah. Bus bays would be provided for passengers to transfer between buses or load/unload for activities at the University. Arrangements would be negotiated with the University to utilize parking in the vicinity of the stadium when not needed for University activities.

**Travel Demand Management (TDM)**
TDM Strategies would be used to encourage potential transit patrons to shift from auto travel to mass transit. The following are some strategies for use in trip-reduction programs in the Airport-Downtown-University Corridor:

- Vanpooling with private vans—UTA's Rideshare program will assist van owners and commuters to contact each other and form private vanpools.

- Parking management strategies—employer incentives or disincentives that encourage employees to adopt alternatives to driving alone. Raising parking rates and limiting the available parking discourages solo commuting particularly when combined with reserve preferred parking spaces for car/van pools.

- Bicycle commuting can be encouraged by providing secure, well-lit bicycle parking facilities, including showers. The UTA will develop bicycle facilities and amenities in conjunction with development of TDM programs.

- Telecommuting with the aid of computers, modems, telephones and telefaxes can improve employee productivity and save on hidden costs such as hiring and training staff by increasing employee retention. It also saves office space. Three forms of telecommuting to consider include working from home, from a satellite office, or from a neighborhood work center.

- Carpooling–UTA's Rideshare program offers free assistance in connecting commuting drivers and riders.

- Employer-sponsored "guaranteed ride home" programs provide emergency transportation to employees who normally ride mass transit.

- UTA's Rideshare program leases vans to employers and organizes riders, routes and drivers and helps determine rider fees.

- Alternative work hours other than the standard eight-to-five schedule allow commuters to travel at non-peak hours, thereby reducing congestion and VMTs.

**Transportation System Management (TSM)**
TSM would be used to reduce congestion at three intersections:

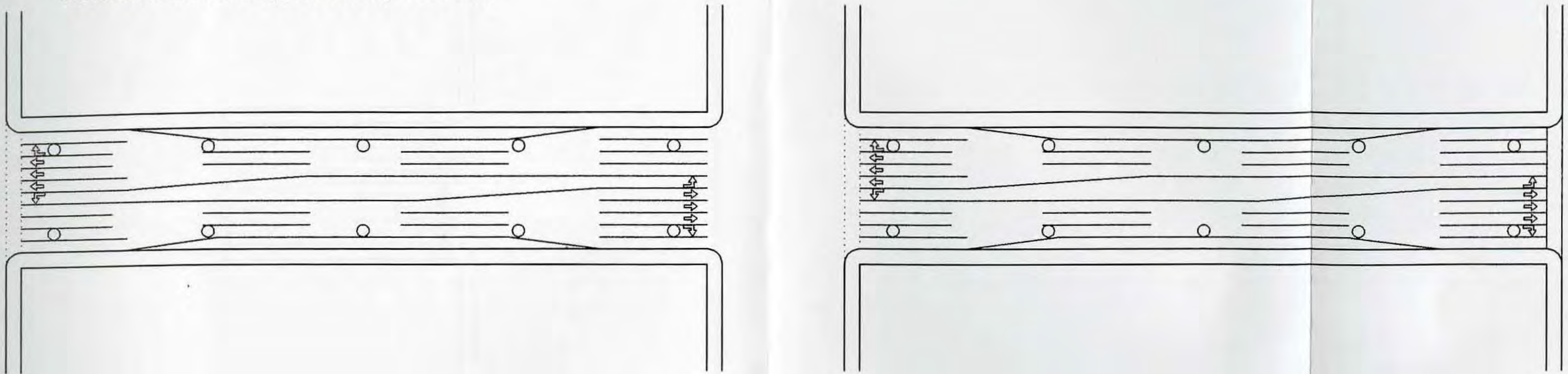
- North Temple and Redwood Road
- 700 East and 400 South
- 1300 East and 500 South

**Arterial Street Cross Sections**
This alternative provides High-Occupancy Vehicle (HOV) lanes to facilitate west-east travel. The existing roadway would be striped to reconfigure lanes. The HOV lanes would be designated as the first travel lane in from the curb. The proposed typical cross section for 400 South and North Temple are shown in Figure 2.3-3 and Figure 2.3-4, respectively.

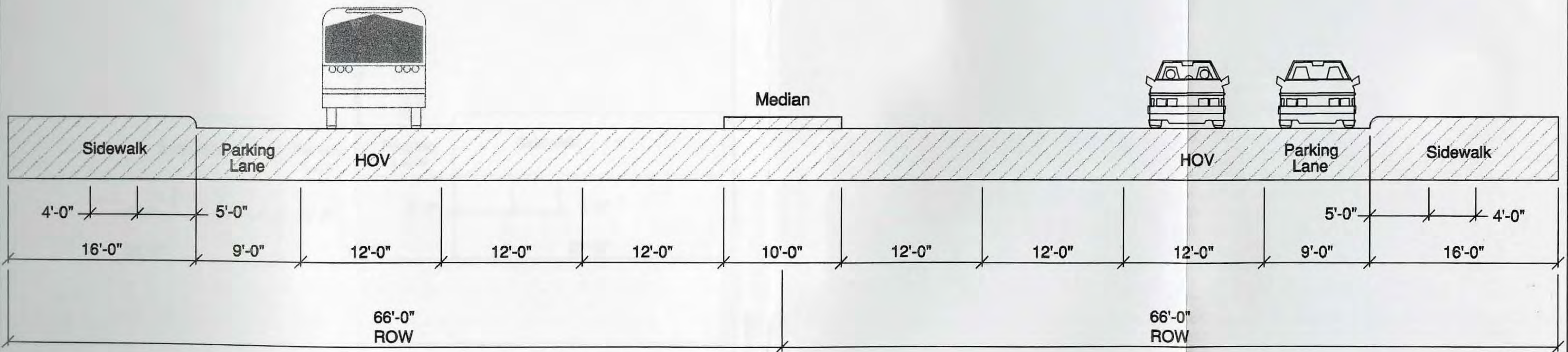
**Coordination with Bicycles and Pedestrians**
The primary transit improvement for this component is a corridor bus service that would provide passengers with a bus every five minutes in each direction most of the day. Access to the system would be a bus stop every two or three blocks, and a lot where people could park their cars or be dropped off. Those within a reasonable walking distance of a bus stop or transit center will walk and board buses. Bus shelters and other passenger amenities will be available to accommodate passengers waiting for the next bus.

Passengers who are not within walking distance of a bus stop transit center may choose to ride a bike to access the system. Bicycle racks and lockable bicycle lockers will be provided at major bus stops and transit centers. If passengers plan to use their bicycle at the destination end of their trip, they will be able to mount a bike on the front of the bus similar to current UTA practice. During non-peak hours, passengers can board the bus with their bicycles and store them in the back of the bus. This makes it possible for more than two bikers to travel on the same bus during off-peak hours. Bus stops will be located at major cross points or intersections of regional bicycle routes and pedestrian trails.

Note: Dimensions are approximate.
Not to scale. Lane widths, parkstrip, sidewalk, etc. varies throughout the corridor.
Section shown is for approximately 300 East.



Typical Block Site Plan

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West-East Corridor FEIS
HOV Cross Section-400 South

Figure 2.3-3

HOV Cross Section-400 South

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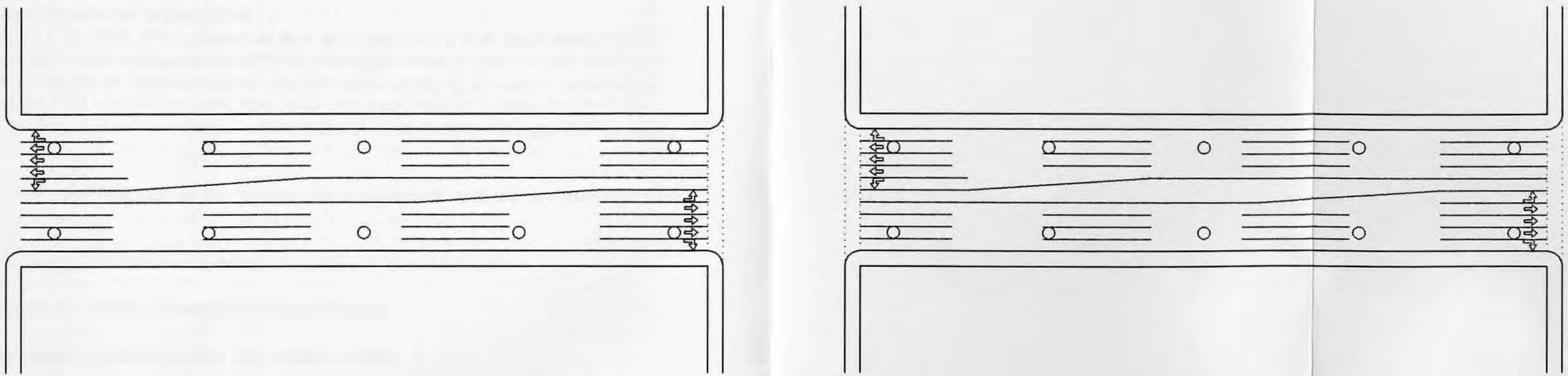
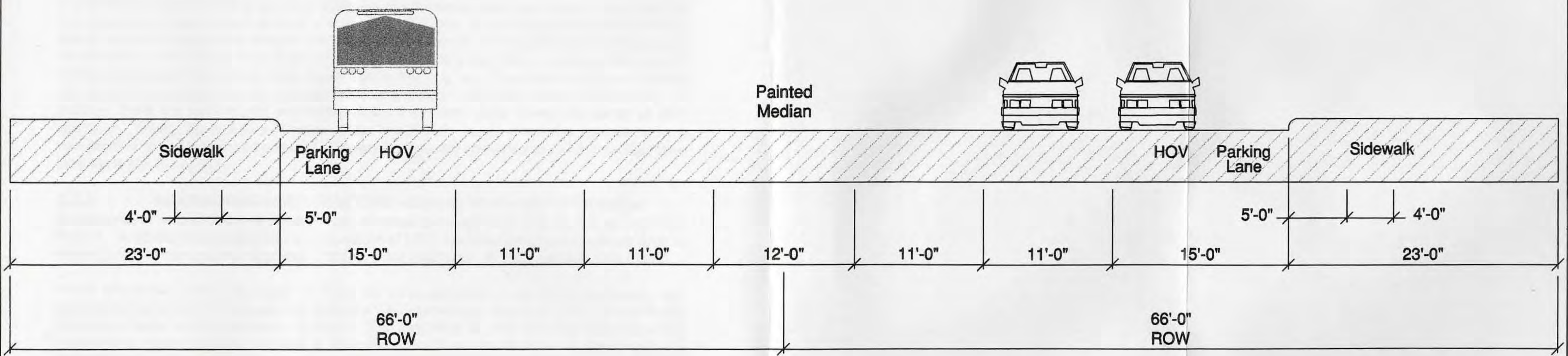
Note: Dimensions are approximate.
Not to scale. Lane widths, parkstrip, sidewalk, ect. varies throughout the corridor. Section shown is approximately 600 West.



Typical Block Site Plan

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West-East Corridor FEIS
HOV Cross Section-North Temple

Figure 2.3-4

HOV Cross Section-North Temple

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**Analysis of Busway Alternatives Considered**
After completion of the MIS/DEIS, FTA requested that an analysis of a bus rapid transit (BRT) alternative be conducted. A BRT system would provide dedicated lanes for bus service within the corridor. These lanes would be separated from regular traffic lanes by a curb or some other barrier. The intent of the BRT system would be to provide an interim solution in the corridor before the implementation of LRT. A busway analysis was prepared in December 1997, by WFRC and the UTA.

The busway analysis examined a total of four options for purposes of analysis and evaluation. These were:

A. Bus/HOV, using conventional buses as described in the MIS/DEIS;

B. BRT - Diesel, dedicated busway using diesel buses;

C. BRT - Electric, dedicated busway using electric buses;

D. LRT, dedicated guideway using LRT vehicles;

Options B and C incorporate the necessary components that facilitate future conversion to an LRT system.

Each busway option was evaluated for a number of factors including consistency with busway policies, capital cost, system capacity, implementation schedule, air quality, BRT service frequency and reliability, modal interface, and operation and maintenance (see Appendix A). As a result of this evaluation, it was determined not to consider BRT further in the West-East Light Rail FEIS. Based on the information and analysis presented in this analysis, it is reasonable to conclude that construction of BRT in the West-East Corridor as an interim phase prior to constructing an LRT system would result in a substantially higher cost in the long run. The interim BRT phase would add up to $210 million in cost over the estimated cost of $364 million to construct LRT initially. In addition, there are non-benefits and inefficiencies that would occur during the period of BRT operation. Finally, there would be major disruption of both transit and traffic operations for a considerable period of time when the BRT busway is physically converted to an LRT configuration (see Appendix A).

### 2.3.3 Alternative C—LRT/TDM/TSM - Locally Preferred Alternative
This alternative uses LRT as the primary mode of travel for transit within the West-East Light Rail Project. In addition to construction and operation of LRT, this alternative would include actions related to travel demand management (TDM) and transportation system management (TSM).

In this alternative, a two-directional LRT line will be constructed to provide high capacity and dependable transit service between the Salt Lake City International Airport (SLCIA) and the Health Sciences Center at the University of Utah. The alignment to and from the Salt Lake City International Airport (SLCIA) will start at the main terminal of the airport at a station specially designed and constructed to accommodate safety requirements for a transit terminus in an airport facility. It will then travel adjacent to the airport/I-80 access road to 2500 West. From 2500 West the LRT alignment will proceed north to North Temple and continue east along North Temple. On

North Temple, across from the Utah State Fairpark, it will interface with a park-and-ride station and then proceed to where a new overpass for LRT will be constructed parallel to and just south of the existing North Temple viaduct. From North Temple the alignment will turn south on 400 West to 400 South.

On 400 South, between 400 West and 200 East, the LRT system will be two single-track alignments, one on each side of the street. East of 200 East, the LRT tracks will transition back to the middle of the street. At all other locations along the corridor, the LRT system will be a double track system running down the middle of the street. Once on 400 South, the LRT alignment proceeds east to 1000 East. The alignment then follows the roadway to 500 South. Continuing along 500 South, the alignment will proceed to just east of University Avenue (along the west side of the Rice-Eccles Stadium parking lot), then turn north over to 400 South, then east on South Campus Drive on the University of Utah campus. The alignment then proceeds along South Campus Drive to Wasatch Boulevard, north on Wasatch Boulevard to Medical Drive then north to the Health Sciences Center. Along portions of the alignment passing through the University, both directions of LRT will operate along one side of the street. For example, it would run along the north side of South Campus Drive and along the east side of Wasatch Boulevard.

**Corridor LRT Stations**

LRT stations will be constructed at key locations along the corridor. Station spacing was developed to balance two conflicting objectives. First, a higher number of stations increases access to LRT from local neighborhoods. Second, each station decreases the average operating speed of the LRT line due to time needed for deceleration, station dwell and acceleration. The potential West-East LRT station locations are summarized below.

**Western Corridor Stations**

- Salt Lake City International Airport Terminal
- North Temple at Winifred Street
- North Temple at Cornell
- North Temple at the Utah State Fairpark
- North Temple east of 800 West

**Downtown Stations**

- 400 West between South Temple and 100 South
- 400 West between 300 South and 400 South
- 400 South between 300 West and 200 West (**proposed future station**)
- 400 South at Main Street

**Eastern Corridor Stations**

- 400 South east of 200 East
- 400 South east of 600 East
- 400 South east of 900 East
- South Campus Drive west of Rice-Eccles Stadium
- South Campus Drive at Central Campus Drive (Fine Arts Museum)
- South Campus Drive at the Huntsman Center
- University Health Sciences Center

**TSM Strategies** would be used to reduce congestion at three intersections:

- North Temple and Redwood Road
- 700 East and 400 South
- 1300 East and 500 South

**TDM Strategies** will be used to encourage potential transit patrons to shift from auto travel to mass transit, or benefit from other trip reducing strategies. As part of the project, UTA will develop a trip reduction program to promote alternatives to auto travel. It will also promote a wide range of strategies for use in trip reduction program in the West-East Corridor. These TDM strategies are the same as listed for the Bus/HOV alternative in Section 2.3.2.

**Arterial Street Cross Sections**
For most of the corridor, the LRT will be designed to be located in the center of the street. The proposed cross section of the light rail corridor changes in the vicinity of the airport from a center mall to a right-of-way along north side of the airport/I-80 access roadway. The light rail corridor is typically 28 feet across between stations, and widens out to about 41 feet (see pg. 4-20) at center of the street stations. The typical cross section of this alternative is therefore significantly different at a station as opposed to between stations. Typical cross sections for 400 South and North Temple are shown in Figure 2.3-5 and Figure 2.3-6, respectively. An overhead view of a typical station cross section is provided along with the typical track alignment between stations on each cross section map.

The width of street right-of-way required at a station will require significant adjustments in existing street geometrics. It may even require widening of the street within the existing right-of-way. Once LRT is constructed, it will be more difficult for left turning movements to be negotiated by traffic running parallel to the LRT lines, except in the downtown area between 400 West and 200 East where the LRT alignment will run single tracks on each side of the street. The left turning lanes will be located in the "shadow" of the light rail station. A protected left turn phase will be required to facilitate this maneuver which may result in a lower LOS for the affected intersections which do not already have a protected phase.

Transit passengers will be boarding both buses and LRT vehicles. LRT transit stations will be located approximately one-half mile apart. This spacing is required to maintain acceptable travel times and control system cost for stations. The front door on each LRT vehicle will be designed to accept passengers from a "high block" which has a ramp that provides access to physically impaired persons. Shelters and other passenger amenities will be available to accommodate passengers waiting for the next LRT train.

Passengers who are not within walking access distance of an LRT station may choose to ride a bike to access the system. Bicycle racks and lockable bicycle lockers will be provided at major LRT stations and at park/ride lots. It may be necessary to limit the number of bicycles allowed to board during peak periods of travel. LRT stations and bus stops will be located at major cross points or intersections of regional bicycle routes and pedestrian trails.

In the case of LRT, special attention will be given to location and design of transit stations where passengers will be transferring to or from the North-South LRT line. Stations will be located to minimize the walking distance between stops on the two LRT lines. Shelters and other passenger amenities will be available to protect passengers from adverse weather. Pedestrian cross walks with traffic signal control will be provided at all stations located in the center of a street.

## 2.4 DESCRIPTION OF LRT ALIGNMENT OPTIONS AND EXTENSIONS CONSIDERED

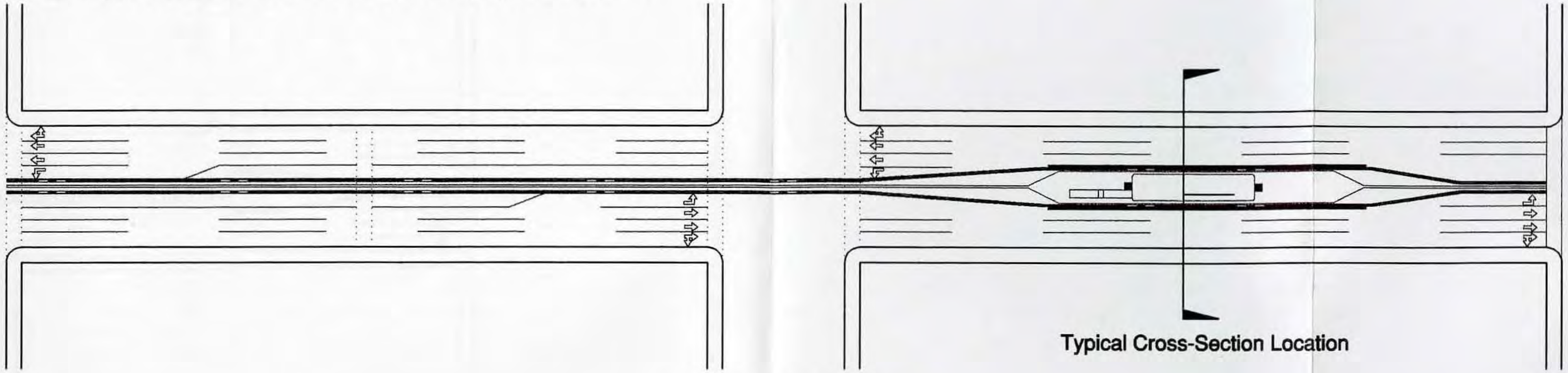
Possible downtown alignment options and LRT extensions were addressed in the MIS/DEIS. In response to DEIS review comments, FEIS coordination meetings, and recent agency input, several downtown alignment options were developed for further evaluation. Also, a west LRT extension to serve the International Center west of SLCIA, and an east LRT extension through the Research Park (southeast of the University of Utah) to This is the Place State Park and Hogle Zoo, were developed for further evaluation during the FEIS process. Appendix B, West-East LRT Alignment Options and Extensions Evaluation Report, fully documents the development, technical analysis, and evaluation results for the six downtown options, one west extension and three east extensions for the Airport to University Corridor. Appendix B also includes a discussion of the evaluation process and criteria; a description of the LRT alignment options and possible LRT extensions; an evaluation discussion of the alignment options and extensions; an environmental constraints analysis; and the evaluation results and recommendations. A brief summary of the evaluation process and the results are presented in the following paragraphs.

The evaluation process for the West-East LRT alignment options and extensions involved the gathering of pertinent technical information about the existing natural and man-made environment. For the downtown alignment options, it was information from North Temple to 600 South and from 600 West to 1000 East. For the extensions it was information pertaining to the International Center and surrounding area (west extension) and the Research Park, This is the Place State Park, Hogle Zoo, Red Butte Arboretum and surrounding area. Field investigations were conducted to assess the engineering feasibility, land use and urban design issues, potential traffic impacts and other design and environmental constraints and opportunities of each of the downtown options and west-east extensions being developed and studied.

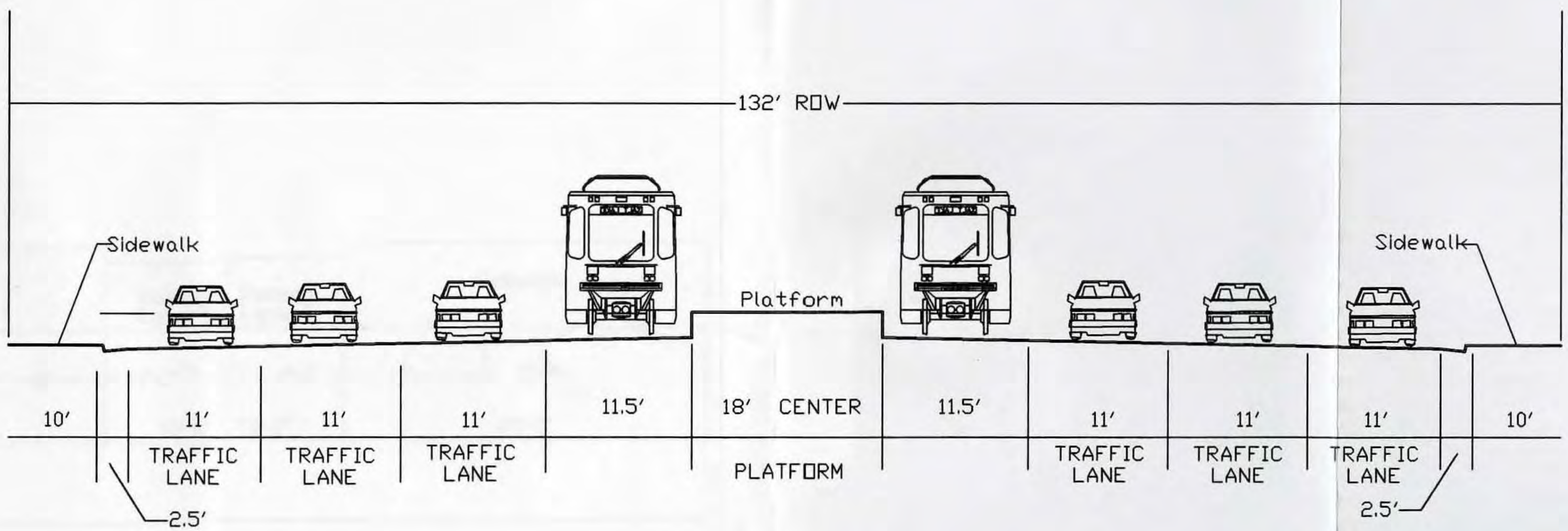
The evaluation criteria for the six downtown alignment options included: LRT travel time; track length; capital cost for structures; additional track needed for downtown circulator extension; walking distance to major destinations; intermodal connections to transit facilities and North-South LRT; exposure to auto traffic; downtown access; bicycle connections; and construction and operational characteristics. For the west extension to the International Center, the evaluation criteria included: interface between a LRT and bus shuttle system; service capability to center businesses; projected employment growth; engineering and environmental constraints; track length; construction costs; number of structures; exposure to auto traffic and utilities relocations. For the three east extensions criteria included: interface with LRT; service to the zoo and state park; service to Research Park and Arboretum area; environmental and historic preservation; water quality and biological resources; Section 4(f) impacts; ability to extend service to Foothill Drive; grade concerns; interface with University of Utah shuttle and UTA buses; and local access between Health Sciences Center and Research Park.

Each downtown alignment option and the west and east extensions were evaluated for the above criteria. They were then compared to the other options or extension alternatives, and subsequently ranked for that evaluation criteria. Each alignment option or extension was then given an overall ranking to determine the reasonableness and feasibility of the alternative. Coordination meetings were held with the Salt Lake City planning staff, SLCIA, Research Park and other stakeholders, as well as the lead agencies of UTA, FTA, and the supervising agency, WFRC, to get their input and suggestions on the evaluation process.

Note: Dimensions are approximate.
Not to scale. Lane widths, parkstrip, sidewalk, etc. varies throughout the corridor. Section shown is for approximately 600 East.




Typical Block Site Plan

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West-East Corridor FEIS
LRT Cross Section-400 South

Figure 2.3-5

LRT Cross Section-400 South

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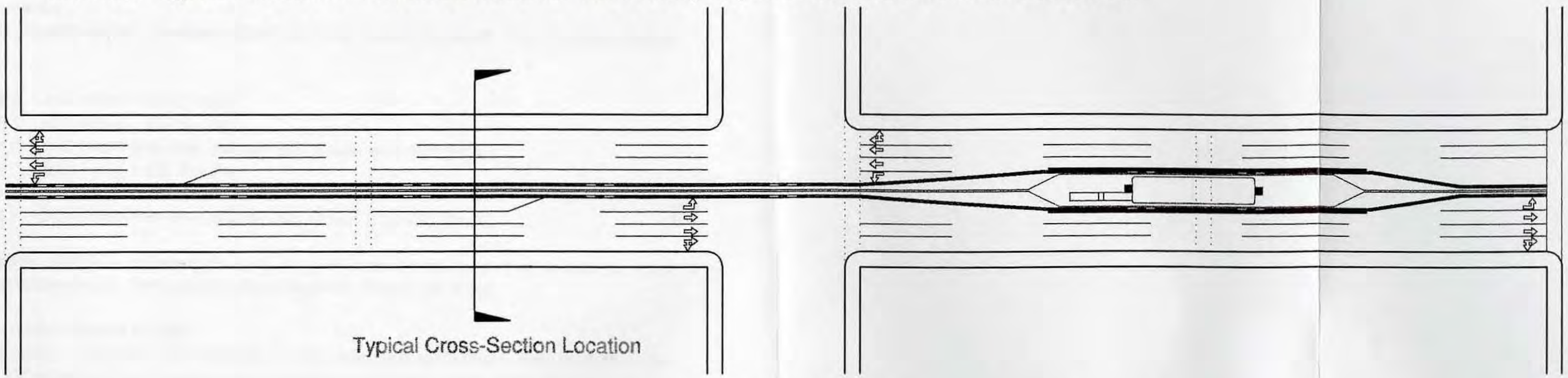
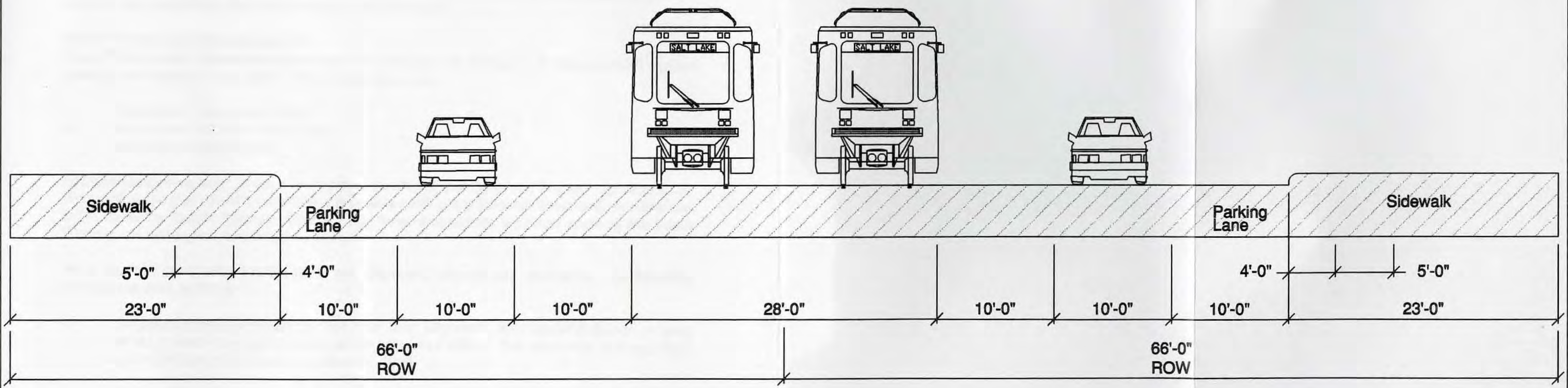
Note: Dimensions are approximate.
Not to scale. Lane widths, parkstrip, sidewalk, etc. varies throughout corridor. Section shown is for approximately 800 West. Typical section shown is between stations. The roadway may need to be widened at station locations.




Typical Block Site Plan

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West-East Corridor FEIS
LRT Cross Section-North Temple

Figure 2.3-6

**Downtown Alignments**
Six LRT alignment alternatives for downtown Salt Lake City were evaluated. The six alternatives are as follows:

- Alternative A - 400 West - 400 South;
- Alternative B - 400 West - 300 South;
- Alternative C - 400 West-one-way pair on 300 South and 400 South;
- Alternative D - 600 West - 400 South;
- Alternative E - 600 West - 300 South; and
- Alternative F - 600 West-one-way pair on 300 South and 400 South.

These six alternatives describe different ways to provide transit service in the downtown area between the intersections North Temple/600 West and 400 South/200 East.

**West Extension - International Center**
As part of this evaluation, a possible LRT extension to the International Center west of SLCIA was conducted. The LRT extension will involve the construction of about three miles of double track line and at least three LRT stations in the International Center. The LRT extension will begin at the planned hotel station on SLCIA property and will either cross over or under the airport access roadways and then extend west, north of I-80 into the International Center on Amelia Earhart Drive or Wiley Post Way. The LRT extension could extend west as far as 5600 West, or perhaps even beyond that point to the planned Bonneville Development.

**East Extensions - Alternatives 1-3**
Three different alternatives were developed for evaluating the feasibility of providing LRT service through the Research Park area. These alternatives are:

- Alternative 1 - Research Park;
- Alternative 2 - Foothill Drive; and
- Alternative 3 - Arboretum

All three alternatives begin at the intersection of South Campus Drive and Wasatch Boulevard. At this location, the main West-East LRT line proceeds north along Wasatch Boulevard, then Medical Drive up to the Health Sciences Center. The three alternatives will head south at the South Campus Drive/Wasatch Boulevard location.

As a result of a detailed evaluation of the alignment options and extensions, the following conclusions were reached.

Preferred Downtown Alignment: One downtown alignment, 400 West/400 South, is being carried forward for implementation as the proposed action. This alignment was approved by the Salt Lake City Council on May 12, 1998.

West and East Extension: A decision has been made not to pursue LRT extensions to the International Center or to the Research Park/Hogle Zoo area at this time. The projected ridership and impacts of these extensions could not justify the cost. However, provisions are being made in the design of West-East LRT to allow these extensions to be built when they are needed. UTA will continue to coordinate with representatives of the International Center and the University for possible LRT extensions in the future.

# SECTION 3
# AFFECTED ENVIRONMENT

## 3.0 Introduction

This section describes the existing environmental conditions in the West-East Corridor for both the man-made and natural environment. Information about the existing conditions in the corridor is presented according to 1) potential type of impact, and (2) geographic sub-area of the corridor.

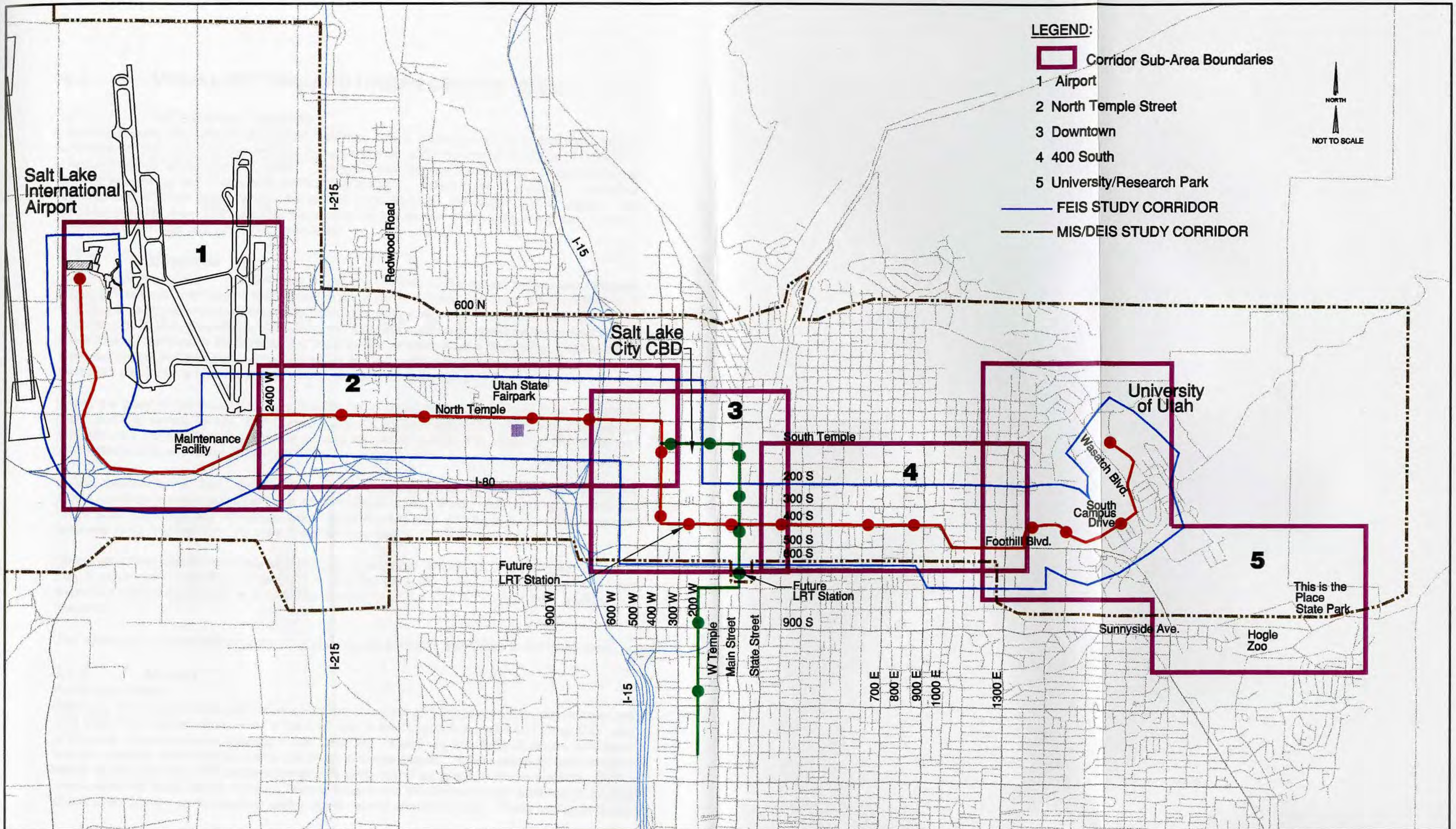
This section provides the existing conditions within the West-East Corridor for

1. Visual Setting and Urban Character
2. Land Use
3. Open Space and Parks
4. Historic and Cultural Resources
5. Demographic and Economic Activity
6. Affected Ecosystems: Vegetation, Wildlife, and Threatened or Endangered Species
7. Wetlands
8. Water Resources and Floodplains
9. Transportation
10. Mineral Resources
11. Noise and Vibration
12. Utilities
13. Air Quality
14. Potential Contaminant Sources
15. Public Safety and Security

The geographic sub-areas were defined to simplify and organize the material for the reader, and to make it easier to locate within this document information specific to a particular neighborhood or locale. Figure 3.0-1, "Map of West-East Corridor Sub-areas," shows the boundaries of the corridor's geographic sub-areas, which tend to correspond to obvious shifts in land use and demographics across the geography of the study corridor. The five sub-areas are:

1. Airport
2. West Central
3. Downtown
4. East Central
5. University

The existing conditions for each sub-area are detailed in the following sub-sections.

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West-East Corridor FEIS
Map of Corridor Sub-areas

Figure 3.0-1

Corridor Sub-areas

## 3.1 VISUAL SETTING AND URBAN CHARACTER

### 3.1.1 Information Sources

The two primary sources of information regarding views, vistas, urban form and development character in Salt Lake City included site reconnaissance and the publication entitled "The Urban Design Element," (Salt Lake City, 1990). The publication defines urban design policy with a goal toward preserving city image and maintaining livability. It serves as a guide to creating an atmosphere in which urban design issues are considered by the public, and by policy - and decision-makers. Also, Salt Lake City master plan objectives and policies regarding view corridors and important visual features were considered.

### 3.1.2 Overview

Salt Lake City is located in the Salt Lake Valley, surrounded by the Wasatch Mountain range on the east and south, the Oquirrh Mountains on the west, and Great Salt Lake to the northwest. It is a typical valley environment within the Basin and Range region of the Great Basin Desert. A cross section of the valley begins in the Wasatch Mountains with high alpine peaks and meadows, flows down its canyons to the foothills and the shoreline of ancient Lake Bonneville, into the valley bisected by the Jordan River, across the valley floor populated by growing communities and dry farmland, and into the foothills and smaller peaks that form the Oquirrh Range.

Along the base of the mountains, communities have grown to the point where their boundaries touch and they appear as one. Salt Lake City is in the northern end of the valley and includes the foothills and Bonneville Bench gently sloping westward across the valley to the more arid environment adjacent to the Great Salt Lake.

In very general terms, Salt Lake City's urban form is characterized by a central core where the tallest buildings and the strongest focus of commercial activity occur. Surrounding this core are lower scale buildings and structures which support uses and activity in the important central business core. Farther from the core, the scale and height of buildings decrease.

Topographic features like the Wasatch Mountains, the Oquirrh Mountains, and the Great Salt Lake play a major role in defining the setting in which Salt Lake City's urban form unfolds. They are important natural landmarks that form the backdrop to the City and orient both visitors and residents.

The Views and Vistas Map in Figure 3.1-1 shows view corridors and vistas in the study area.

### 3.1.3 Airport

**Views and Vistas**

Generally, the view corridors and vistas which are dominant and important to the character of the area lead to the Wasatch Mountains in the east, and to the Oquirrh Mountains and Great Salt Lake to the west. From the airport gateway to Salt Lake City, views along Interstate 80 toward downtown and the Wasatch Mountain backdrop are broad and spectacular. It is possible to experience a sense of the city from this perspective and to understand its place in the landscape. Major monuments like State Capitol Building, Temple Square and the corporate and government skyline of Salt Lake City are easily identified as the tallest central core of the City. These monuments are attractive and provide orientation to residents and travelers. Even at night, the importance of downtown is understood from this viewpoint.

Incongruous elements include several massive power lines traversing the area to and from a substation to the south of I-80; and debris piles located along the edges of the roadway. Wing Pointe Golf Course is a green oasis alongside I-80. Proceeding to the east, the majority of the views are dominated by the wide highway right-of-way (which is sparsely landscaped), views of the airport (and scattered buildings which serve as airport support uses), and a series of highway structures.

**Visual Setting and Urban Form**

The character of the area to the south and west of the Salt Lake International Center and Salt Lake City International Airport (SLCIA) is rather open and rural. Along the highway right-of-way, the visual setting is defined primarily from the highway corridor and the mass of interchanges, ramps and structures, from the development or lack of development along its edges, and from the broad views to the east and the mountains. At the airport, the setting is defined by airport activity and architecture, the noise and smells of aircraft and other vehicles, and the hustle and bustle of arriving and departing people.

## 3.1.4 North Temple

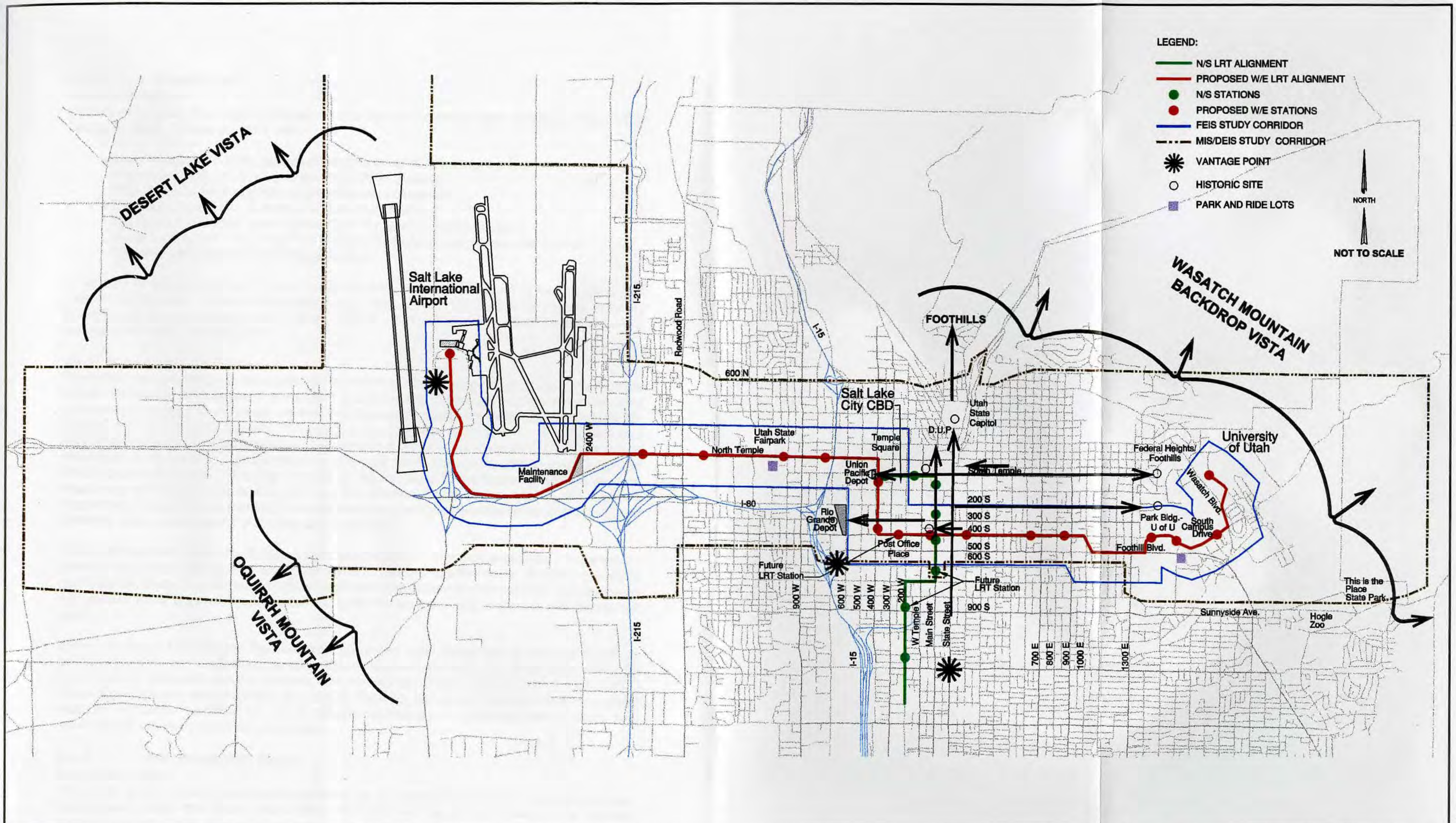
**Views and Vistas**

Distant views along North Temple to the east are dominated by the Wasatch foothills; to the west they terminate in highway structures and distant views of the Oquirrh Mountains. Close-up views along North Temple are dominated by a mix of uses and development. Sometimes the immediate views are pleasant and attractive because of landscaping and architectural design as are those at Utah State Fairpark or the State Government office complexes. In other places, structures and landscapes are deteriorated, rundown and cluttered.

**Visual Setting and Urban Form**

North Temple is essentially a gateway/entry street that is in transition since the construction of I-80 and I-215. Since completion of the two highways, access from the airport and from the west is no longer focused along North Temple. A mixture of commercial (restaurants, fast food and convenience foods, service stations, motels and RV camping/mobile home court), neighborhood services (grocery, laundry, dry cleaner), office, institutional, and light manufacturing uses (several state offices, Utah Power and Light facilities), and the Utah State Fairpark occur along the street. Several areas are not currently developed.

The street is broad, and has no consistent streetscape or urban design theme. The scale of most buildings is one story, with the exception of the office and motel structures. Residential development is almost non-existent along the North Temple corridor; however, there are viable residential neighborhoods north and south of the corridor beginning at approximately 900 West to I-15.

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# West-East Corridor FEIS Views and Vistas Map

Figure 3.1-1

Views and Vistas Map

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### 3.1.5 Downtown

**Views and Vistas**

Downtown is either the origin or the terminus for several view corridors identified in the Urban Design Element. These corridors are:

- State Street to the State Capitol Building and the surrounding foothills;
- Exchange Place terminating at the Post Office Building;
- Main Street to the Daughters of Utah Pioneers Museum;
- 200 South east to the University of Utah Park building;
- 300 South terminating at the Denver and Rio Grande Railroad Depot;
- South Temple from the Union Pacific Depot to Federal Heights and the foothills;
- First Avenue terminating at Temple Square.

In addition to these very specific view corridors and vistas, the surrounding landscape is also identified as important. Views north toward Ensign Peak, west to the Oquirrh Mountains including Great Salt Lake, and east along the Wasatch foothills all establish the sense of place and setting in which Salt Lake City has grown.

**Visual Setting and Urban Form**

The North Temple viaduct is an opportunity to view the western edge of downtown in a broader sense. Billboards, railroad yards, dilapidated structures and industrial buildings dominate views and interrupt views to the downtown skyline, the Wasatch Mountain backdrop, and the historic Rio Grande and Union Pacific Depots. This view is of the Gateway District - the emerging 650 acre area of development and redevelopment targeted for a broad mix of uses that includes a strong residential component of approximately 1,700 units and nearly one million square feet of office/commercial space. With the removal of railroad track in the Gateway District and the shortening of new viaducts at 400, 500 and 600 South, access and visibility in this area will dramatically change. These pending and proposed changes have the potential to dramatically and positively affect visual quality and views at this gateway.

Along 400 West, the Union Pacific Depot and Delta Center are important landmarks. To the south, Pioneer Park (circa 1898) is a historic green space covering one entire block. Between the depot and the park, there is much vacant railroad land and other underutilized industrial parcels mixed with parcels where old structures have been adapted for attractive new residential and commercial uses.

Along 400 South from Pioneer Park to State Street, the older urban form of one and two-story buildings is giving way to taller new development and redevelopment. This is the area where the new Scott M. Matheson Courts Complex was recently completed directly across from historic Washington Square - site of the City and County Building, and where new hotel and convention facilities are under construction. Underutilized parcels are in transition due to rapid new development within a block in any direction.

### 3.1.6 400 South/500 South

**Views and Vistas**

Along 400 South, close-up views along the street are generally focused on the commercial uses. Looking east along 400 South, views follow the alignment up to the hill where the roadway transitions to 500 South and heads to the University. Views of the University of Utah and of the

Wasatch Mountains terminate the eastern views. Looking west along 400 South, views are toward the ramps accessing I-15 and the Oquirrh Range.

**Visual Setting and Urban Form**

The character of the 400 South corridor is predominantly commercial, particularly from State Street to 900 East. Most of the area is developed, so the established character and visual setting will likely remain. Large office buildings and high-rise multi-family residential structures occur at each end. The remaining development is generally one and two-story structures. 400 South is an active, vital corridor that serves nearby employees and residential neighborhoods.

### 3.1.7 University Park

**Views and Vistas**

From many locations on the campus, western views to the Great Salt Lake and the Great Basin Desert are impressive and broad. This is also true of views from Research Park, This Is The Place State Park and the hillside trails above Red Butte Garden and Arboretum. With downtown Salt Lake City and the urban forest as a foreground, views and vistas are orienting, memorable and attractive. From the campus, views to the mountains on the east are dominant. In the foreground, the unique quality of Fort Douglas and the park-like quality of the Research Park are attractive views.

**Visual Setting and Urban Form**

The dominant urban form is campus/office park-like. The University of Utah and Fort Douglas are open in character and landscaped. On campus, green lawns and street trees tie the buildings and development together. Mature trees in most of the areas provide continuity and visual strength. At Research Park, the openness and green lawns provide an attractive setting for large office buildings and research facilities. The overall appearance is pleasant and stately.

## 3.2 LAND USE

### 3.2.1 Information Sources

Land use information was obtained primarily from Salt Lake City Zoning Maps and visual reconnaissance. Salt Lake City recently completed a revision to its zoning ordinance map which reflects existing land use patterns. Because the mapping was completed recently and is based on existing development patterns, it is an accurate depiction of current land uses in developed areas of the City. In undeveloped and under-developed areas of the City, the zoning map shows an anticipated condition based on neighborhood planning documents, community desires and anticipated development interests. It is in these undeveloped and under-developed areas where the greatest potential for change can be expected and where zoning maps do not accurately depict the existing situation.

For example, the area to the west and south of the Salt Lake City International Airport (SLCIA) and the Salt Lake International Center is zoned for manufacturing; however, most of the land is currently undeveloped. If future development interests change, there is the potential for a major development center. Additionally, the 650 acre Gateway District just west of downtown will also change land uses and character dramatically as new plans are completed and major infrastructure elements change. Again, a major development center is likely to emerge. With these two exceptions, existing zoning accurately represents existing land use.

The on-going reconstruction of the Interstate 15 corridor will affect future development and land use. Parallel streets and cross streets have been improved to increase their capacity to minimize commuter delay during the I-15 reconstruction. When the I-15 project is complete in October 2001, the extra capacity will remain. As a result, this could influence land use and employment densities in the area as additional capacity and improved access makes the area more attractive to development. Downtown and support areas surrounding it are locations for accommodations, event venues, and shopping.

These conditions and others are described in the following paragraphs and are indicated on the Land Use Map in Figure 3.2-1. In order to graphically illustrate concentrations of development on the map, all single-family zones, duplex zones, or other zones which are relatively low in residential density are combined. Multi-family zones are either medium or high density. Some commercial zones are combined if they have similar characteristics. Downtown zones are shown separately. Business and research park uses are combined, as are the two institutional and the two manufacturing zones. Open space, public lands and airport are the remaining designations. The combined zones help to illustrate concentrations of development and reveal fairly strong development patterns in the developed portions of the City. These areas of density are complementary to transit because they have the potential to increase ridership.

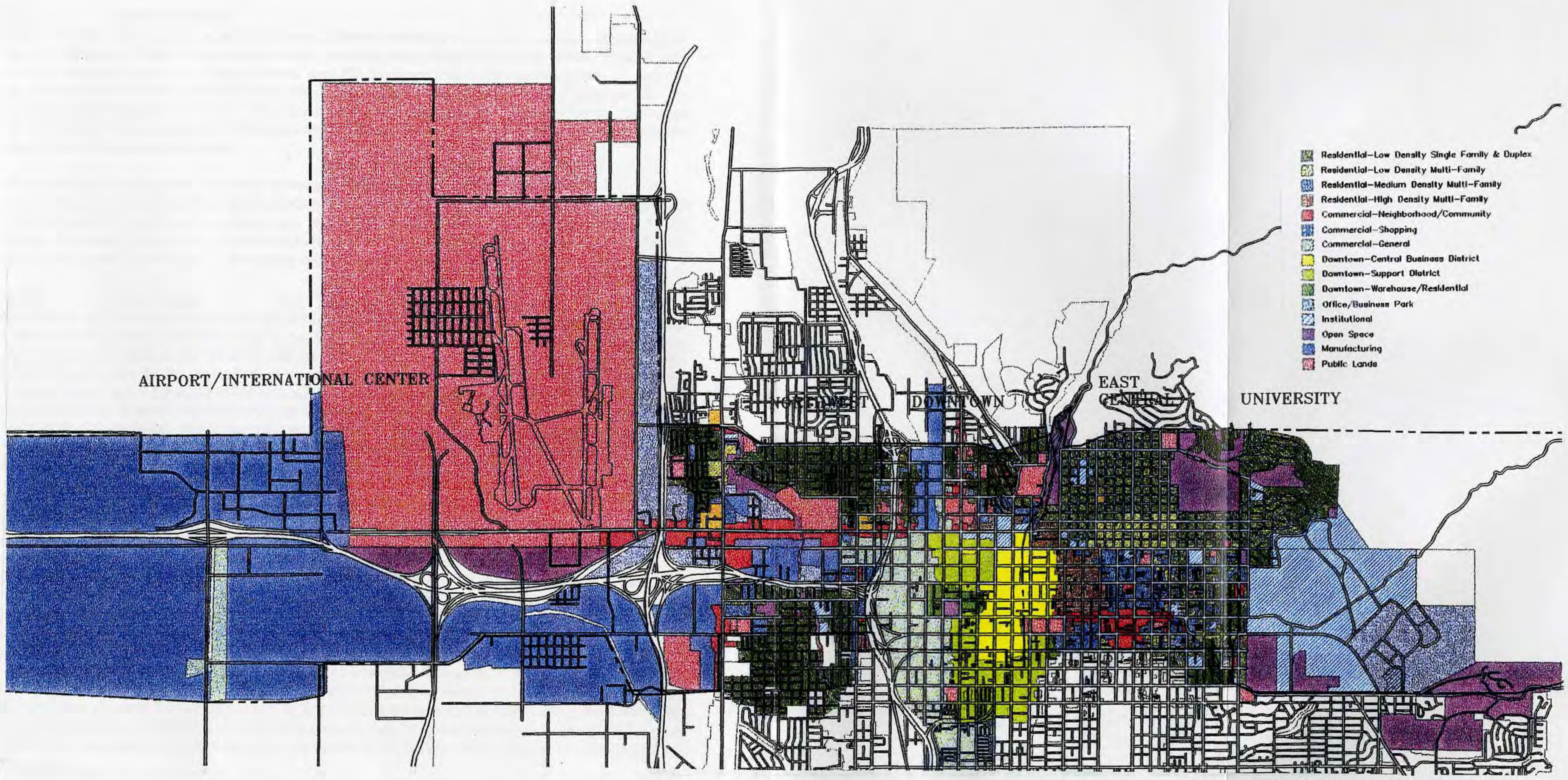
### 3.2.2 Airport

The western-most portion of the corridor includes the SLCIA and surrounding airport and industrial/business-related uses. This portion of the corridor also includes the Salt Lake International Center (a business and industrial park), and the Wing Pointe Golf Course. Much of the area west of the International Center and south of Interstate 80 is undeveloped. Development south of the airport is also planned for manufacturing, and includes some existing businesses and airport-related business activity.

The airport is a hub of travel and business activity for the city and the state. In addition to the many airport-related businesses within the secure boundary of the airport, there are numerous airport-related businesses located adjacent to airport property that are strongly tied to airport activity or support activity. The airport has a major influence on development patterns in the area because of various airport Protection Zones and ordinances which place restrictions on building heights and certain kinds of land uses, specifically residential. It is likely that land uses that are currently developing in the area will continue to grow and eventually consume the remaining developable land in the area. Thus, at build-out, it could become an important employment center.

**Secondary Development / Redevelopment Potential**

Much of the area west and south of the International Center is zoned for manufacturing and/or business park uses. However, this is one area of the city where land use and development patterns are not firmly established and can potentially change. Lands to the north of the International Center are zoned agricultural and open space which reflects current uses for grazing, wildlife habitat and wetlands. While not directly in the corridor, this area is important from a transportation and transit perspective because it has often been identified as a potential mixed-use and planned residential community.




This map is based on the Salt Lake City Zoning Map. It accurately depicts land use in all areas of the corridor except: the area know as the Gateway District, which is changing from industrial and commercial use to mixed use; and the area south and west of the airport, which is relatively undeveloped at this date.

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## West-East Corridor FEIS Land Use Map

Figure 3.2-1

Land Use Map

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### 3.2.3 North Temple

North Temple is a mixture of development patterns including strip-type commercial properties, several clusters of State Government offices, industrial uses, the historic Utah State Fairpark, and traveler services such as motels, hotels, and RV campground/mobile home parks. It has the appearance of an area in transition as parcels are upgraded and renovated (For example, the Econo-Lodge just west of I-15.) The development of several State office buildings, the large apartment complex at about 1700 West, and new facilities at the UP&L complex all reflect the expansion of activity in the area.

**Secondary Development / Redevelopment Potential**

Much vacant and underutilized land remains along North Temple which will become attractive to redevelopment or secondary development, particularly in areas near potential LRT stations. In the future, the State Fairpark may expand facilities and its current events and programs, thus offering opportunities and incentives to redevelop nearby areas

### 3.2.4 Downtown

Downtown includes major commercial, shopping, hotel/motel, corporate office and government uses, as well as arts and entertainment facilities. It is a major activity and development center in the corridor and includes the State Capitol and offices, World Headquarters of the Church of Jesus Christ of Latter-day Saints, Abravanel Hall and Salt Lake City Arts Center, Salt Palace Convention Center, Delta Center (Utah Jazz Basketball), Temple Square, Capitol Theater, Salt Lake City and County Building, Scott M. Matheson Courts Complex, Salt Lake City Public Library, and many other important civic facilities. It is a central gathering place for sporting and arts events, conventions and conferences, and special events such as the Utah Arts Festival, Days of Forty-Seven Rodeo, parades and other public events and gatherings.

**Secondary Development / Redevelopment Potential**

While there are many potential opportunities for secondary development and redevelopment in the downtown area, the largest and most important is the Gateway District. The Gateway District partially falls within the City's federally designated Enterprise Community. The 650-acre Gateway District is the area between approximately North Temple and 900 South and from 300 West to the I-15 Corridor. It has been the subject of much planning and development attention throughout the past three years beginning with the "Visionary Gateway Plan," 1994, which focused on the potential for high density, mixed-use urban development and identified the necessity of removing and shortening I-15 viaducts and consolidating the railroad tracks. The "Rail Consolidation Study," 1997, carried the visionary plan further by documenting the feasibility of removing and relocating most of the trackage which now obstructs development and circulation in the area. The "Gateway District Land Use and Development Master Plan" was adopted by Salt Lake City in August, 1998. It defines circulation systems and establishes hierarchies of streets and open spaces, determines mixed land use patterns of development, and identifies important urban design considerations for the district.

The proposed developments within the Gateway District include approximately 1,700 residential units and nearly one million square feet of office/commercial space, hotel, entertainment, restaurants, and a Buddhist Temple. This includes the large mixed-use development on approximately 25 acres west of the Union Pacific Depot with residential, retail, office and entertainment uses) and the seven-acre "Bridge" project on 200 South and 500 West (including some residential, community support services, and the Buddhist Temple).

Other relatively new redevelopment and adaptive reuse projects such as California Tire and Rubber, Salt Lake Stamp, and others are examples of the trend in the Gateway District toward more housing and mixed-use development.

Salt Lake City received a grant under the Brownfields Pilot Program to evaluate contamination in the Gateway District. Redevelopment of some properties in the Gateway District must include environmental remediation. An estimated 83 percent of the district could be redeveloped for commercial and industrial use without environmental cleanup, and 53 percent could be redeveloped for residential use or as public parks without cleanup. There are, however, potential environmental problems at some specific properties where historic uses have involved hazardous materials. EPA has funded preparation of model cleanup plans to assist property owners to overcome limitations to development on their properties.

The 400 South corridor between 400 West and State Street is also changing due to the influence of new developments such as renovation of the post office building, the new Scott M. Matheson Court Complex, and nearby expansion of hotel/motel and convention facilities. Existing underutilized land will be very attractive for new development and will also benefit from LRT access.

### 3.2.5 400 South/500 South

Service-type commercial uses (restaurants, fast food and convenience foods, service stations, and small specialty shops), many of which serve the residential neighborhoods, are concentrated on 400 South. Recent planning decisions have reinforced this pattern by creating mid-scale retail shopping areas serving local and neighborhood needs (Fred Meyer Center and Family Center developments). Residential development on 500 South to 1300 East includes high-rise apartments. Residential as well as commercial uses can benefit from LRT access.

North and south of 400 South, residential neighborhoods that include single-family, multi-family and higher-density housing are dominant. These are some of the oldest neighborhoods in the city. The city has aggressively protected this housing stock and has attempted to halt its demolition for commercial office structures in these areas. Maintaining and preserving residential neighborhoods has been one of the city's strong policy goals for several years. The current zoning supports those goals and designates the area as a high-density urban neighborhood.

**Secondary Development / Redevelopment Potential**

There is less potential for secondary development and redevelopment in this area. It is fairly stable and not likely to change in dramatic ways. There is always the potential for changes in use and intensification of use, but it is likely to occur on a small scale and to follow the established patterns. Developments such as the 4th Street Market at 650 East are an example of the kind of changes and redevelopment anticipated.

### 3.2.6 University

After leaving 500 South, the alignment turns north along University Avenue, adjacent to residences on the west side and a parking lot on the east. Here it turns east and into the University campus.

The eastern end of the corridor includes the University of Utah and University Health Sciences Center. They are both major activity generators with educational, health care, cultural and recreational attractions. Development on the University of Utah Campus (including the Medical Center) is anticipated to increase, adding more medical facilities and educational buildings. Land use patterns are fairly well established in the area and likely to persist into the future. New development will include housing for 2002 Winter Olympics athletes which will become student housing after the Olympics.

**Secondary Development/Redevelopment Potential**
Fort Douglas has the potential of changing use as the University of Utah has acquired half of the base and the other half may also change uses as the Army Base is eventually dismantled. Some restrictions will apply to redevelopment of the base because of its historic status.

## 3.3 OPEN SPACE AND PARKS

### 3.3.1 Methodology

Parks and open space information was obtained from the Salt Lake City Parks and Open Space Plan, adopted by the Salt Lake City Council in October, 1992, and the Salt Lake City Zoning Ordinance and Map. Salt Lake City's open space system includes numerous natural amenities such as the Jordan River, Great Salt Lake wetlands, canyon streams and mountain ranges, as well as a wide variety of developed parks, recreation facilities and open space corridors. The goal of the Parks and Open Space Plan is to connect the elements of the system throughout the City. Within the study area, there are several parks and recreation facilities, bicycle paths, existing trails, and designated open spaces. These elements are shown on the Parks and Open Space Map (See Figure 3.3-1).

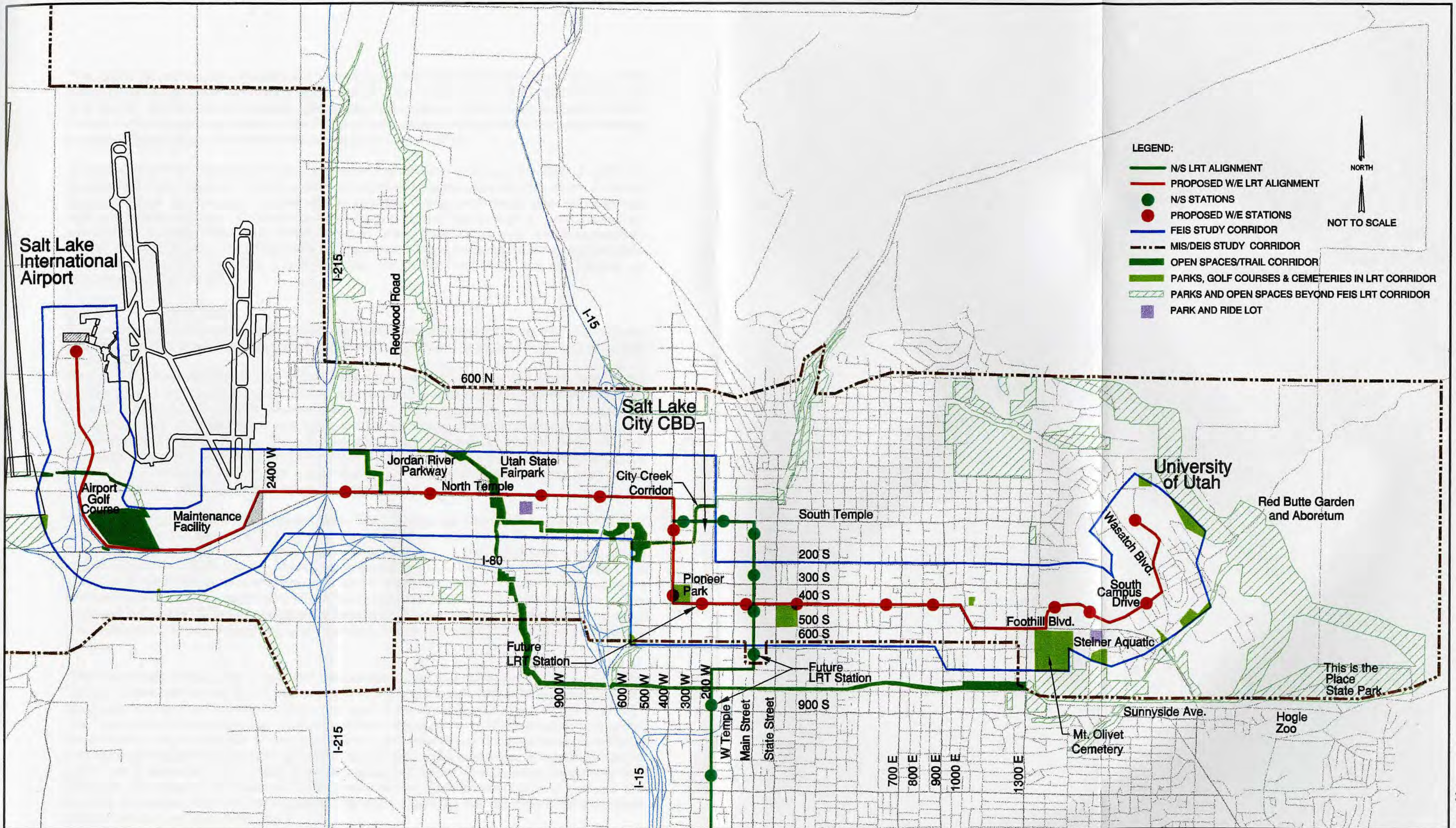
### 3.3.2 Airport

Designated open space in this section of the corridor includes the Wing Pointe Golf Course, a public facility operated by Salt Lake City Parks and Recreation. It is located immediately south of the SLCIA adjacent to I-80, and forms part of the entry landscape into the airport. Most of the area north of the International Center is designated as agricultural use or open space because of existing grazing uses and wetland habitat; however, some of this area may ultimately develop into a planned residential mixed-use community.

The Open Space Plan identifies a Transvalley Corridor, which follows the railroad right-of-way just west of the International Center property. This is a major east-west open space corridor running from the mouth of Emigration Canyon to Bailey's Lake adjacent to Great Salt Lake. It is intended to serve pedestrian and bicycle needs.

### 3.3.3 North Temple

The Jordan River Parkway is the dominant open space in this portion of the study area. It runs north/ south at approximately 1300 West. The Jordan River Parkway was designated several years ago and has gradually become incorporated into planning efforts by neighboring jurisdictions. In Salt Lake City, it is an important north/south connection. At the Jordan River and approximately 600 North, the parkway expands into Riverside Park, a municipal park approximately 20 acres in size that is operated by Salt Lake City Parks and Recreation. The parkway includes a combined bicycle and pedestrian trail along its entire length, forming an important north-south link in the region's system of recreational trails.

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West-East Corridor FEIS
Parks and Open Spaces Map

Figure 3.3-1

Parks and Open Spaces Map

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The Jordan River Parkway crosses North Temple just to the west of the Utah State Fairpark. The Fairpark, owned and operated by the State of Utah, is the site of the annual Utah State Fair and is a favorite site for special concerts, gatherings, conventions, trade shows and other events. Further south, the parkway passes under I-80 and winds its way through residential neighborhoods in areas where trail improvements have begun to be implemented.

A small portion of the Westpoint Corridor follows a route adjacent to the eastern edge of I-215 and as proposed would meander through residential neighborhoods just west of I-215, where it crosses North Temple at the Fairpark. It is intended to provide a buffer and amenity between residential uses and commercial uses. Once across North Temple, it meanders through an undeveloped site adjacent to the Jordan River. This parcel, known as "White Park", is currently owned by the State of Utah and is no longer a designated park site; however, a transition between the Westpoint Open Space Corridor and the City Creek/Gateway Redevelopment Area corridor should be accommodated on the site.

### 3.3.4 Downtown

Five important existing urban open spaces and parks are included in the vicinity of downtown: Pioneer Park; City Creek Park; Memory Grove Park; the Galivan Center; and Washington Square.

Pioneer Park, located between 300 and 400 West and between 300 and 400 South dates to the earliest days of Salt Lake City when the various camps of pioneers were consolidated within the walls of "Old Fort." In 1879, it became the property of Salt Lake City and was dedicated as "Pioneer Square" in 1898. It has had a rich and varied history and was recently improved with Redevelopment Agency funds. The improvements were primarily in infrastructure, i.e. new restrooms, sewer and water lines, and electrical and water service to allow for programming large events in the park such as concerts and festivals, and to support existing events such as the "Farmers Market" which operates August through October.

City Creek Park is Salt Lake City's newest park. The city returned City Creek to the surface after being buried for 85 years. Water from City Creek still flows under North Temple to the Jordan River. City Creek Park is located directly across State Street from the LDS Church Headquarters at State Street and North Temple. At the same time City Creek Park was being developed, the LDS Church completed a complementary park on the south side of North Temple to commemorate Mormon history and the settlement of the Salt Lake Valley. Both of these new parks were dedicated in October 1995 and represent the beginning of a long master-planned goal of returning City Creek to the surface through the west downtown area of Salt Lake City known as the Gateway District.

West from State Street, City Creek now runs underground in a concrete conduit along North Temple. Plans call for the City Creek to return to the surface near State Street, and meander southwest through the Gateway District. This area of the city is described in Section 3.2, "Land Use," and is planned to become an urban mixed-use neighborhood which incorporates the green stream corridor as a major part of the urban fabric of the area. Plans that have been considered include ponds and stream corridors, open spaces and trails, parks and plazas which celebrate the creek and its passage to the Jordan River and Great Salt Lake. The Gateway District and City Creek are connected to the Westpoint Open Space Corridor along a railroad right-of-way and 100 South to the Jordan River and the Fairpark. The exact alignment that the resurfaced City Creek will take has not yet been determined.

Washington Square (between 400-500 South and State Street and 200 East) is the setting for the historic Salt Lake City and County Building. The building and the seven-acre park which surrounds it were extensively renovated and rededicated in 1989. Washington Square is an important green space at the southern end of the Central Business District and is the frequent site of community gatherings and festivals such as the Living Traditions Festival which celebrates the cultural diversity of the City.

### 3.3.5 400 South/500 South

There are no public parks or open spaces within or adjacent to the 400 South corridor. The closest is Faultline Park at approximately 1050 East 400 South. It is a small open space in the center of the residential neighborhood. It is part of a system of earthquake faults along the Wasatch Mountains foothills which has remained undeveloped and is now preserved as an open space. The proposed LRT alignment shifts to 500 South at 1000 East and does not pass adjacent to Faultline Park.

### 3.3.6 University

Many designated open spaces and trail corridors exist near the University of Utah and Research Park. These include the Bonneville Shoreline Trail, This Is The Place State Park, Hogle Zoo, Red Butte Canyon, Red Butte Garden and Arboretum, Sunnyside Park, and Steiner Aquatic.

The University of Utah is the major educational facility in the area. The proposed alignment goes through the campus along South Campus Drive. Street trees on either side of this road may be impacted by expansion of the paved surface. The alignment then turns north, past the University of Utah Golf Course to provide service to the University Medical Center and other University buildings and development. At the intersection of South Campus Drive and Wasatch Boulevard, the alignment shifts from center-of-the-road to the east side of the roadway outside of the existing paved area, which will impact the existing landscaping and mature trees.

## 3.4 HISTORIC AND CULTURAL RESOURCES

### 3.4.1 Information Sources

Historic and cultural resources were investigated using existing information available from the Utah Division of State History, the State Historic Preservation Officer and the Salt Lake City Historic Preservation Officer. Neighborhood planning documents were also reviewed for neighborhoods located in the corridor study area. Figure 3.4-1 "Historic Districts and Structures Map," shows the location of National Register sites, Salt Lake City register sites and historic districts.

### 3.4.2 Significance of National Register of Historic Places Designation

Designation on the National Register of Historic Places means the property has a place on an official federal list of properties that are significant in American history, architecture, archeology and engineering. A listing on the National Register does not interfere with private property rights to alter, manage, or dispose of the listed property. The owner is not required to restore or maintain the property, or to keep it open to the public; however, there are in some cases local ordinances which affect modifications to structures. In the case of Salt Lake City, proposed exterior alterations to any property on the National Register must be reviewed by the preservation planner and the Historic Landmark Commission.

To be eligible for National Register designation, a property must be at least 50 years old and have retained most of its original appearance and character. If properties on the National Register are affected, the State Historic Preservation Officer must be consulted to determine possible effects.

Applicable codes include Section 106 of the National Historic Preservation Act of 1966 requiring Federal agencies to take into account activities affecting historic properties and Section 9-8-404 of the Utah Code Annotated, which requires state agencies to take into account its activities affecting historic properties.

### 3.4.3 Significance of Salt Lake City Register Designation

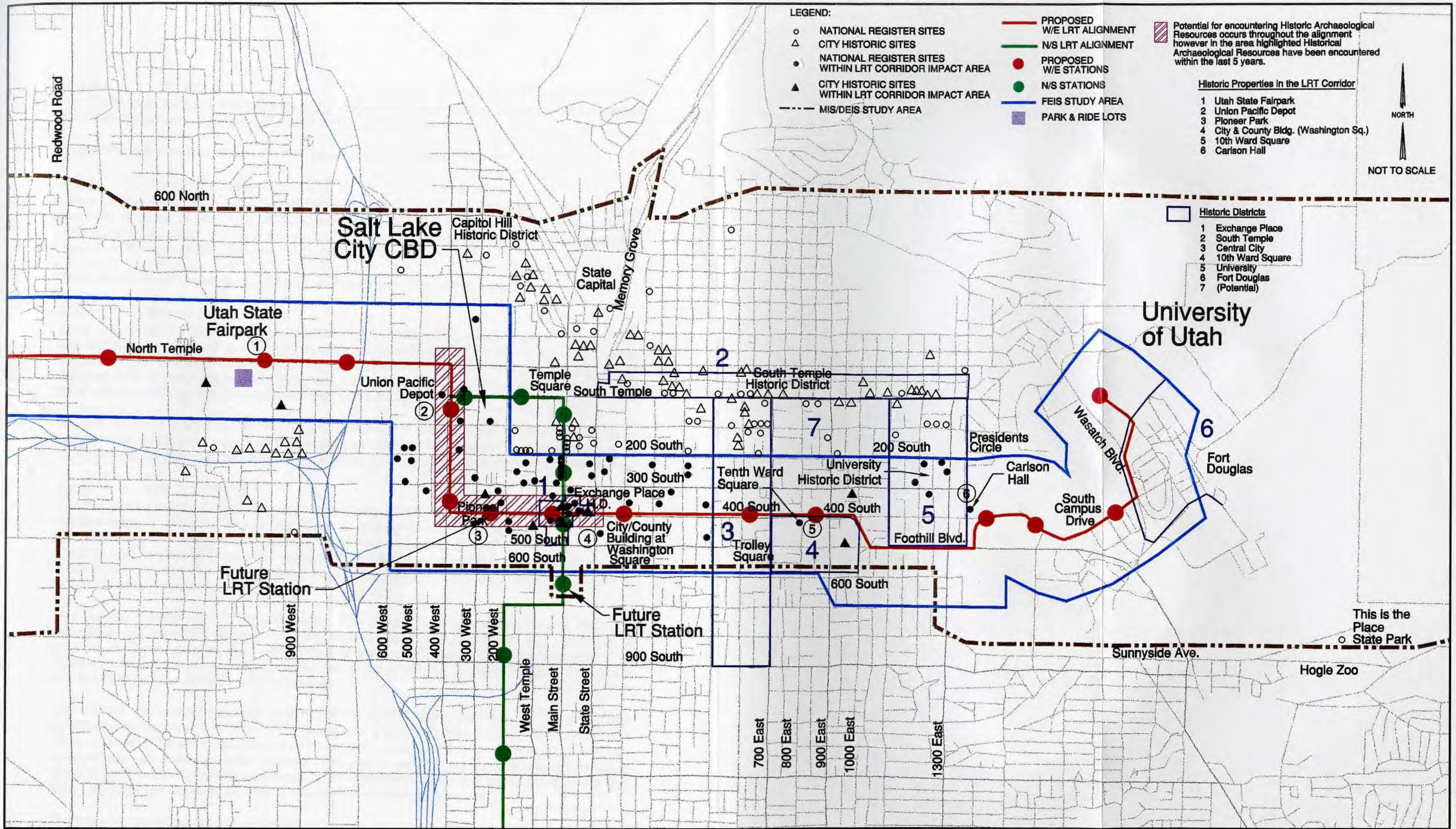
Designation on the Salt Lake City Register generally follows the same requirements of the National Register. Again, use or disposition of the property is not affected except that proposed exterior changes must be reviewed by the preservation planner who will make a determination regarding review by the Historic Landmark Commission. The Preservation Officer and Historic Landmark Commission also review any action proposed within a historic district. Applicable sections of the Salt Lake City zoning ordinance include: Part II, Section 3-5 establishing the Historic Landmark Commission and Part III, Section 17-1 describing procedures affecting historic preservation overlay districts. If properties listed on the Salt Lake City Register are affected by any proposed action, such as alteration, relocation, or demolition, a Certificate of Appropriateness must be submitted and approved by the Historic Landmark Commission.

### 3.4.4 Section 106 Review

Section 106 of the National Historic Preservation Act of 1966 requires every federal agency to take into account how its project will affect historic properties and prehistoric and historic archaeological sites. Activities which require evaluation include construction, rehabilitation, demolition, etc. State and local governments using federal assistance are also required to comply with Section 106 Review.

Section 106 Review requires consultation with the State Historic Preservation Office (SHPO) when determining eligibility, effect, and mitigation. Eligibility is determined if a structure is already on the National Register of Historic Places, or if the building is 50 years old or older, the site is determined to yield information important in prehistory or history, and most of the original appearance and character remains intact.

Effect refers to potential impact to the site. No Effect causes only minor changes, no Adverse Effect requires more work, but meets Secretary of the Interior Standards, and Adverse Effect will cause damage or diminish the historic integrity of the property. According to Utah SHPO, "archaeological sites that are affected by projects are determined to be not adversely affected if the historic property is of value only for its potential contribution to archaeological or historic research, and the information can be preserved through conduct of appropriate research."

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WASATCH FRONT REGIONAL COUNCIL
420 West 1500 South, Suite 200
Bountiful, Utah 84010

PARSONS TRANSPORTATION GROUP
DE LEUW, CATHER & COMPANY

**West-East Corridor FEIS**
**Historic Districts and Structures Map**

Figure 3.4-1

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### 3.4.5 Airport

The SLCIA and Salt Lake International Center contain no historic districts or historic sites identified on either the National Register or the Salt Lake City Register.

There are no known prehistoric or historic archaeological sites in this area.

### 3.4.6 North Temple

There are no historic districts located along North Temple. One historic property, the Utah State Fairpark, is listed on both the National and Salt Lake City Registers. It is a complex of approximately 80 acres, including arenas, barns and other historic structures. It is located on the north side of North Temple between 1000 West and the Jordan River.

There are no known prehistoric or historic archaeological sites in this area.

### 3.4.7 Downtown

The downtown portion of the study area contains the Exchange Place Historic District. This district was Salt Lake City's major non-Mormon commercial district and sported Utah's first skyscrapers. It contains two National Register sites: the Salt Lake Stock & Mining Building and the Judge Building. Both of these are approximately one-half block from the proposed alignment. Several other nearby buildings may be eligible for the Historic Register.

There is reason to believe that excavation activity along 400 West and 400 South in the vicinity of Pioneer Park may encounter prehistoric or historic archaeological resources. In recent excavations in the area, human remains and other artifacts have been discovered in the roadway right-of-way.

### 3.4.8 400 South

The Tenth Ward Square located on the southwest corner of 400 South and 800 East is on both the National Register and the Salt Lake City Register. It includes three original structures: the 1873 meeting house, the 1909 chapel, and the district school house built in 1887. It was once a part of a "ward of industry" which employed hundreds of people and which created a demand for housing in the area. Little remains of those early industrial beginnings in the area; however, the nearby residential area is still a viable neighborhood.

Two historic districts occur along 400 South. The University Neighborhood Historic District is between approximately 50 South and 500 South, and between Virginia Street and 1100 East. It consists of low- to medium-scale structures that are primarily residential. It also contains an abundance of large, mature street trees and residential structures. None of the structures along 500 South are on the National or City Register.

The Central City District (approximately 50 South to 600 South, 500 East to 700 East) was established for settlement by Mormon Pioneers with a gridiron pattern of wide streets and large 10-acre blocks. The settlement was based on Joseph Smith's "Plat of the City of Zion," and lots were provided as homesteads for farmers. This part of the city remains primarily residential in character and includes seven homes listed on the National Register and seven listed on the Salt Lake City Register. None of the historic homes are affected by the project.

There are no known prehistoric or historic archaeological sites in this area.

### 3.4.9 University

The vicinity of the University of Utah includes several important historic and cultural resources. The University of Utah is the state's oldest and largest public institution of higher education. The campus contains several important historic buildings that are listed on the National Register. These include all of the buildings fronting on President's Circle, such as Gardner Hall, the Park Building, the Utah Museum of Natural History and Kingsbury Hall. In addition to being an important educational and medical facility, the University is a center of cultural life in Utah. It offers museums, performing arts theaters and other cultural and sporting facilities. The University of Utah campus and Red Butte Garden and Arboretum at the mouth of Red Butte Canyon make up the State Arboretum of Utah.

Historic Fort Douglas is almost completely surrounded by University of Utah property. Most of Fort Douglas is University property. About 50 acres is owned by the military. This property includes several buildings from the 1860s, a military museum and a collection of historic residential structures which surround a parade ground. Many of the buildings are constructed of native sandstone. Buildings on the Fort Douglas Officers Circle are designated on the National Register and the Salt Lake City Register. Carlson Hall, located at the corner of University Avenue and South Campus Drive, is listed on the National Register of Historic Places. Several other buildings nearby may be eligible for the National Historic Register. For example, Nielsen Fieldhouse across from Rice-Eccles Stadium is eligible for the National Register. There are no known prehistoric or historic archaeological resources in this area.

## 3.5 DEMOGRAPHICS AND ECONOMIC ACTIVITY

This section presents a profile of economic and demographic conditions within the Salt Lake City region, corridor, and within the corridor's five sub-areas (see Figure 3.0-1). Just as density and land use are important factors to the success of public transit, so are economic trends because they can have an influence on land use, i.e. the demand for office/commercial space may be stronger than housing, for example, or vice versa. Currently, in the Salt Lake Valley, the market for multifamily rental housing, commercial and retail space and office space is strong. All of these rather high density uses are supportive of LRT and other forms of public transit.

Real estate and economic trends, whatever they may be, are also affected by public policy and planning. Where these conflict, decisions have to be made - to change policy and planning direction, or not - depending on the desired community outcome. Generally, to support LRT, ridership needs to be at sufficient levels, and adequate ridership usually requires high-density development nearby (within one-quarter mile). Consequently, to increase the potential for a successful LRT system, its stations should be located to serve high density areas or in areas where planning policy will support the development of high density uses.

**Statewide Economic Trends**

Based on the following indicators and trends, Utah's economy remains sound. Utah's employment growth added 46,300 jobs in 1996, at a 5.1 percent growth rate. In comparison, the job expansion rate in the United States in 1996 was 2 percent. This is important because for the first time since 1950, Utah achieved job growth of 5 percent or greater for four consecutive years, 1993 through 1996. In addition, for the ninth year in a row, 1996 job expansion was greater than 3 percent.

Labor workforce shortages continue to plague Utah, especially in and around Salt Lake County and within the construction industry. The manufacturing industry in Utah has slowed somewhat in 1996 as compared to 1995; however, Utah still added 5,300 new manufacturing jobs and grew at a rate of 4.3 percent, while the United States experienced a simultaneous net loss in manufacturing jobs. Utah's trade industry expanded with the addition of 10,000 new jobs, an increase of 4.6 percent over 1995. Wholesale trade grew slightly faster than did retail trade: 5.2 percent versus 4.4 percent. Food stores and home furnishing stores accounted for the largest growth in retail trade. The service industry experienced the greatest increase in 1996 with 17,200 new jobs, representing a growth rate of 7.2 percent. Finally, Utah's government sector added 2,800 new jobs, primarily at the state and local level.

Utah's average monthly wage increased 4.1 percent in 1996 from 1995 to $2,016. In both 1996 and 1995, Utah's average wage increases exceeded increases in inflation. Average wages in Utah continue to be lower than United States averages, in part due to the fact that Utah has a large number of young people in the work force who earn lower wages and that Utah has a higher percentage of people working part time.

There are 21 employers with 4,000 or more employees within the State of Utah, 2 of which are located in the corridor. There is a total of 1,459 employers with 100 or more employees within the State of Utah, and 217 of them are located within the West-East Corridor. It is significant to note that the majority of large employers are located both within Salt Lake City and in vicinity of the LRT alignment.

**Salt Lake Metropolitan Region Trends**

The metropolitan region resides within the Salt Lake Valley, which is located on the western edge of the Wasatch Mountains and just southeast of the Great Salt Lake in north central Utah. The valley boundaries are generally coterminous with boundaries of Salt Lake County which contains a total of thirteen cities including two small ski towns, Alta and Brighton. The county contains eleven other urban and suburban cities including Salt Lake City, South Salt Lake, West Valley City, Murray, Midvale, West Jordan, South Jordan, Sandy, Draper, Riverton, and Bluffdale. While many of these communities have been established since the arrival of the Mormon pioneers in the mid-1800s, growth in the Salt Lake Valley has historically occurred in a southerly pattern originating near the downtown area of Salt Lake City, located in the northeast section of the valley.

As is indicated in Table 3.5-1, Salt Lake City ranks fourth in comparison to surrounding metropolitan areas in terms of Gross Metropolitan Product, with $35.76 billion in 1997. The Salt Lake City area ranks 52nd nationally.

| Table 3.5-1<br>1997 Gross Metropolitan Product<br>(Billions Dollars, Current) | |
|---|---|
| Metropolitan Area | 1997 |
| Phoenix-Mesa, AZ | 86.29 |
| Denver, CO | 65.75 |
| Las Vegas, NV | 41.18 |
| Salt Lake City, UT | 35.76 |
| Albuquerque, NM | 21.03 |
| Reno, NV | 12.02 |
| Boise, ID | 11.06 |

Source: Standard & Poor's DRI

Salt Lake County, together with three neighboring counties, Utah, Davis, and Weber, form the Wasatch Front region, a provisional multi-county planning district that in 1996 included nearly 77 percent of the State's population and encompassed approximately 4.4 percent of Utah's land mass. In 1996, population in the Wasatch Front reached almost 1.55 million, an increase of 173,448 people since 1991. Per capita personal income in the is region was $20,206 in 1996, which is slightly higher that the state figure of $19,384 and almost $5,000 more per month than the 1991 region figure. (Source: The Bureau of Economic and Business Research; University of Utah.)

The Wasatch Front region's economic base is fairly diverse with much of the area employment provided by small businesses. Core segments of the region economy are Services, Trade, and Government. The Wasatch Front has historically been dependent on government contractors in the defense and aerospace industries. The Salt Lake Valley is the financial and manufacturing center for the inter-mountain region (including Idaho and Wyoming). The rate of job growth exceeds population growth in the Wasatch Front region. From 1991 to 1996, a total of 166,797 new jobs were created in the region, totaling a 28 percent increase over six years. Population growth in the same region over the same time period was 13 percent. The Wasatch Front region's unemployment rate in 1995 was 3.2 percent, slightly less than Utah's rate of 3.5 percent and significantly lower than the U.S. unemployment rate in 1996 of 4.9 percent. (Source: The Bureau of Economic and Business Research; University of Utah.)

For much of this century development has been concentrated in Salt Lake City and along the central core of the valley. In recent years, major growth areas have included the southeastern bench areas (Sandy and Draper), and the southwestern bench areas (West Jordan and South Jordan). While these heavy-growth sectors have typically been suburban, residential areas, in recent years more commercial activity is occurring outside of the traditional core locations. Nearly 69 percent of all housing permits issued in 1996 were for residential construction within the Wasatch Front region; 79 percent of non-residential construction valuation was for projects completed within the Wasatch Front region. (Source: The Bureau of Economic and Business Research; University of Utah.)

Major retail concentrations exist in downtown Salt Lake City, the downtown of West Valley City, the State Street Corridor of Murray, the Fort Union commercial complex and the South Towne complex in Sandy.

### 3.5.1 Project Area

**Population.** During the 1970s, Salt Lake City's population decreased 7.3 percent, and during the following decade, it decreased another 2 percent. Population estimates collected between 1990 and 1994 show the city's population increased a total of roughly seven percent over those four years rather than the projected 2.6 percent. During the early 1990s, Salt Lake County's population also increased slightly faster than predicted. Since the study corridor resides within Salt Lake City and since the projected growth rate in the corridor exceeds that of Salt Lake City, it is probable that some of the greater-than-expected population growth occurred in the corridor as well. Salt Lake City's population has grown significantly faster than predicted and by mid-1994, already exceeded 1995 projections. Salt Lake County is also growing faster than projected, but only by about one-half percent. Total population growth in Salt Lake County is projected to exceed corridor population growth by 50 percent.

In 1990, based on the WFRC Land Use Surveillance Data, the West-East Corridor was home to almost 50,800 persons, approximately 32 percent of Salt Lake City's population. By 1996, the corridor population had grown to approximately 51,800. The population is primarily concentrated within the North Temple and 400 South areas. The West East Corridor is a subset of Salt Lake City, and future growth in the population of Salt Lake City is projected to occur within the corridor.

**Demographic and Economic Activity.** Total population in the West-East Corridor was projected to increase about 0.3 percent per year between 1990 and 1995. Population growth is then expected to accelerate to an average annual growth rate of 1.4 percent between 1995 and the year 2020. This roughly 40 percent total increase will boost the population to over 72,000 by the year 2020. Simultaneously, suburban areas outside of Salt Lake City continue to expand, Salt Lake County's population is expected to grow 77 percent between 1990 and 2020, and reach over 1.3 million by the year 2020. This information is reflected in Table 3.5-2.

Population and housing projections in the West-East Corridor include some anticipated pockets of growth between the years 2000 and 2020. They include a new 300 single-family housing unit development near the airport, the development of 25 acres of residentially-zoned property in the North Temple area just south of North Temple and the conversion of military housing at Fort Douglas Army Base to University of Utah student housing and for the Athlete's Village during the 2002 Winter Olympics. Residential development estimates in the Gateway region of the North Temple area and some planned high density housing in the 400 South area are also included.

All areas within the corridor are anticipating some increase in population between 1990 and 2020. Most of Salt Lake City's growth is occurring within the corridor. New concentration and dispersion of population along the selected West-East LRT alignment will likely occur as more redevelopment opportunities are identified.

**Demographics and Ethnicity.** The median age for the corridor is 29 though in specific portions of the corridor the median ranges from age 23 in the University area to age 37 in the downtown area. Although more older people live in the downtown area, the young population in the University keeps the overall corridor median age very close to that in Salt Lake City and Salt Lake County (30 and 28, respectively). The downtown and 400 South areas have fewer than half as many children per population as the County, while the airport (albeit with a very small total population) and North Temple areas have almost as many children per capita as the County. The corridor age distribution closely mirrors Salt Lake City. The North Temple and airport areas have about the same number of children as a percentage of the population as Salt Lake City and Salt Lake County. Downtown and the 400 South area have the fewest children. There are fewer children and more adults living in the corridor than in Salt Lake City or County. While Salt Lake City has a higher proportion of elderly than is found in the corridor, the corridor has a greater proportion than the Salt Lake County metropolitan area.

The West-East Corridor is approximately 84 percent Caucasian, two percent African-American and two percent American Indian. (See Table 3.5-3.) In addition, an estimated 5.5 percent of the population along the corridor is of Hispanic origin. The North Temple area has the highest percentage of African-Americans and individuals of Hispanic origin—almost two-and-one-half times that of the corridor. The West-East Corridor is more ethnically diverse than either Salt Lake City or Salt Lake County. There are roughly two-and-one-half times as many African-Americans and American Indians and twice as many individuals of Hispanic origin as a percentage of the population in the study corridor as in Salt Lake County. The corridor is slightly more diverse than Salt Lake City.

There is a lower education level among West-East Corridor residents than typically found in the county. With almost twice the proportion of the population having less than a ninth grade education, a higher percentage of individuals have not graduated from high school. The majority of these individuals live in the North Temple or in the downtown areas, while the most-educated live in University area where over 60 percent of the residents have at least a bachelor's degree. Overall, the education attainment of individuals in the corridor closely mirrors that of Salt Lake City.

**Development.** Growth in the number of dwelling units in the corridor is projected to out-pace that of Salt Lake City by one-half percent per year between 1995 and 2020 (see Table 3.5-4). When the Gateway District is completely built-out with its planned high density residential structures ranging from single-room units to high-end condominiums, over 8,200 new dwelling units will probably be added. The addition of roughly 300 single family homes is possible near the airport and several high density residential structures are being planned in the 400 South area. Even so, the number of dwelling units in Salt Lake County is expected to grow at a significantly higher rate over the same time period with an estimated 175,000 new housing units planned.

**Income.** Overall, the corridor contains some of the poorest areas in the city, with the downtown area having the lowest median income in the study area, Salt Lake City and Salt Lake County. Due to the high percentage of low income people living in the area, the corridor median income of $18,750 is 23 percent lower than Salt Lake City and 60 percent lower than in Salt Lake County. The exception is the University area where median income is almost three times higher than the median income in the downtown area, the poorest section. In addition, the University area median income is 100 percent higher than that in Salt Lake City and 54 percent higher than the median income for Salt Lake County. Downtown has the highest proportion of low income residents, although the 400 South area has the highest actual number of low income people in the corridor.

The corridor's employment center is downtown with over 50,000 employees; however, significant employment activity is in the 400 South area as well, with over 40,000 employees. The University (including Research Park) area and the airport/International Center area employ between 24,000 and 25,000 people each in the corridor (Table 3.5-5). The greatest growth in employment opportunity is in the Gateway District of the North Temple area and may actually exceed projections if current plans for development of the Gateway are realized. In 1996, people employed in the downtown area included roughly 6,900 persons in retail, 42 percent of total retail employment in the corridor. However the East Central area also has a high retail employment with approximately 5,900 employees or 36 percent of the corridor's total. Of the over 32,000 industrial employees in the corridor in 1996, almost half were employed in the airport and International Center area.

About 60 percent of Salt Lake City's retail sales occur within the West-East Corridor. Over 80 percent of those sales are generated in the downtown and 400 South areas, with almost $550 million reported in 1995. In comparison, the only other area of significant retail sales in the corridor is the 400 South area with over $300 million in 1995. Overall, retail activity within the corridor accounts for about 17 percent of retail sales in Salt Lake County.

The following sections further detail the economic and demographic trends within each of the five sub-areas within the West-East Corridor.

### 3.5.2 Airport

Though large geographically, the airport area consists of predominantly vacant land and currently has the lowest population density within the corridor. The airport area is a suburban neighborhood with almost 90 percent of its housing as single units and 65 percent owner occupied (1990 Census). This area has the least amount of ethnic diversity in the corridor.

Current Salt Lake Planning Commission projections indicate that this area will add about 300 new single-family residences just east of the airport in the next two decades. Recent findings show developmental constraints in this subarea, (so some of the previous WFRC projected residential growth and subsequent population increases will not occur).

In the area west of the Airport, residential development opportunities are limited. Soil, seismic, and water concerns in conjunction with industrial encroachment make residential development unappealing. In addition, a new west runway at the airport will change noise patterns and reduce the amount of residential development allowed. Just east of the airport, around 1700 North, the forecast includes the addition of 300 single family houses, or about 840 residents.

A busy and growing hub of business activity in the region is located in a 725-acre industrial park just west of the airport at the Salt Lake International Center. About 144 firms employ over 11,000 people in this area. Approximately two thirds of the land area is dedicated to industrial activity, while the remaining third is primarily used for light manufacturing plants, office, retail and hotel space. Many businesses operate two or three shifts per day. Over the next five years, plans are underway to add five hotels at the International Center, from 8 to 13. This will increase the number of hotel room by roughly 67 percent to 1,840 rooms. Especially significant is projected increase in hotel and restaurant guests and employees, from about 1,500 per day in 1997 to over 2,500 per day when completely built out to capacity.

### 3.5.3 North Temple

Given current development plans, the North Temple area has significant potential for change over the next few decades. This area has several older industrial areas along North Temple slated for redevelopment. Early estimates indicate the cumulative Gateway and North Temple population will more than double between 1995 and 2020 if completely built out to capacity. Completion and absorption time lines are still evolving.

In the North Temple area, between the Jordan River and Interstate 15 and between North Temple and Interstate 80, lies roughly 25 acres of residentially zoned land. A significant amount of vacant or underutilized land also exists along North Temple. Assuming compact development of 30 units per acre on 25 acres, 750 new dwelling units would be added. Applying the 1995 Salt Lake City average household size of 2.2 persons, the population would increase by 1,650.

Education levels are very low in the area with a larger proportion of residents with less than a ninth-grade education in the study area residing in the North Temple area; over twice that of Salt Lake City and more than three times that of Salt Lake County. This area also has the lowest concentration of college graduates.

The North Temple area is one of the most ethnically diverse sub-areas of the corridor as 13% of the total sub-area population is hispanic origin.

### 3.5.4 Downtown

The downtown area has a population of roughly 7,000, and while the Wasatch Front Regional Council does not expect the numbers to increase much through the year 2020, there are many development projects proposed that could increase in population. The downtown population has highest median age of 37 and the highest percentage of residents over the age of 65. Downtown also contains some of the state's lowest-income residents and has the lowest median income level found either in the corridor or as compared to Salt Lake City and Salt Lake County.

The downtown area is the financial and business center of the inter-mountain west. It supports the largest concentration of employment in the state of Utah with over 50,000 employees in 1996. New office buildings and hotels are being constructed including over 700 new hotel rooms and expansive convention space at Little America Hotel, and a new 13-story, 350 room upscale business class hotel at the corner of 200 South and State Street. Existing buildings are being remodeled to accommodate the need for additional office and hotel space. Redevelopment of the Gateway District could add over 19,000 new jobs.

Downtown is also a major retail center, primarily supported by two large shopping malls. Roughly 40 percent of Salt Lake City's total retail business occurs within the study corridor, and 32 percent of that 40 percent occurs in the downtown area. Although there has been a shift of retail activity to suburban locations over the past two decades, retail activity in Salt Lake City still accounts for 27 percent of the total Salt Lake County retail business.

### 3.5.5 400 South

Over the past decades, the 400 South area has experienced commercial encroachment and declining residential population. This area is characteristically mixed-use with residential, commercial and offices. This area is the home to some of the older residential areas in the corridor and the city. Neighborhoods are becoming stronger with renewed investment in renovation and infill. This particular area is often affected by activities in the adjoining subareas—specifically, downtown and the University of Utah.

The 400 South area has the largest number of housing units (over 16,000) of any neighborhood in the corridor, but growth potential is declining because of market saturation and commercial displacement of residential dwellings. In recent years, the City has made a commitment to reduce commercial infringement on the neighborhoods east of 200 East by way of zoning amendments.

Existing conditions within the 400 South/500 South area include the Eagle Garden Apartments located between 300 South and 400 South, and 500 East and 600 East, which are being built by the American Housing Development Company. In addition, by 2020, projected high density residential complexes and or medium density residential complexes will add a total of about 1,900 new residents.

The 400 South area contains an active commercial base generating over $300 million in retail sales in 1995. This accounts for about 30 percent of retail sales in the study corridor and totals about 58 percent as much volume of retail sales as generated in downtown.

### 3.5.6 University

The University area has the youngest, most highly educated population not only in the corridor but in all of Salt Lake City and Salt Lake County. Twice as many people per capita have bachelor's degrees and almost four times as many have graduate or professional degrees as in any other part of Salt Lake County.

The University of Utah is a major employment center with approximately 13,000 employees and 27,000 students. This area draws employees, students, Medical Center patients, and other visitors from the entire region. The University is surrounded by a stable, attractive neighborhood, the highest median income and the lowest portion of inhabitants over 65 years of age in the corridor.

In the University area, 2,400 additional students are expected to reside in the Fort Douglas Housing Complex, based on relocating 1,200 existing students, and adding 1,200 new students. Student residential living numbers are likely included in census figures currently, and because their presence on campus has direct transportation ridership impacts, the total of 2,400 was used for the purposes of this study. In addition to housing, this complex will include a dining facility, as well as major pedestrian malls and shuttles.

The University is the home tc many special events in the region, including year-round sporting events at both Rice-Eccles Stadium and the Huntsman Center, music concerts at Huntsman Center and Red Butte Garden and professional meetings and conventions.

The University of Utah Health Sciences Center employs over 4,800 people and routinely draws patients and visitors from at least a five-state region. The Medical Center handles approximately 350,000 outpatient visits each year with a daily average of 1,500 (assuming 240 working days/year.) The Health Sciences campus, includes not only the hospital and medical school, but also the Colleges of Pharmacy and Nursing, Eccles Library, Utah State Department of Health, Primary Children's Medical Center and the Huntsman Cancer Institute, and employing over 9,300 faculty and staff. Adjacent to the medical campus is the new University of Utah Fort Douglas Student Housing complex, which by the year 2000 will house roughly 2,400 students. This complex will be used for the Athletes Village during the 2002 Winter Olympics.

Research Park, with 240 acres available for lease, is located in the southeast region of the University area. More than 73 businesses currently located there employ just over 5,200 people.

The three largest employers in Research Park are Evans and Sutherland, the Association of Regional and University Pathologists (ARUP) and Northwest Pipeline Corporation. The 220-room University Park Marriott Hotel is located adjacent to Research Park. Research Park expects to grow to over 7,000 employees in the next 8 years.

**TABLE 3.5-2**
**WEST-EAST CORRIDOR**
**POPULATION 1990-2020**

| | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|---|---|---|
| Airport | 59 | 77 | 77 | 287 | 497 | 707 | 917 |
| North Temple | 12,929 | 13,261 | 13,378 | 17,117 | 20,765 | 24,413 | 28,060 |
| Downtown | 6,783 | 6,983 | 7,071 | 7,151 | 7,265 | 7,217 | 7,215 |
| 400 South | 25,525 | 25,482 | 26,322 | 26,707 | 27,092 | 27,477 | 27,862 |
| University | 5,476 | 5,840 | 6,466 | 8,318 | 8,318 | 8,318 | 8,318 |
| Total Corridor | 50,772 | 51,643 | 53,314 | 59,580 | 63,937 | 68,132 | 72,372 |
| Salt Lake City | 160,852 | 165,995 | 172,950 | 176,236 | 181,659 | 183,058 | 187,133 |
| Salt Lake County | 733,906 | 819,232 | 875,525 | 957,678 | 1,127,683 | 1,174,598 | 1,301,655 |

Source: Wasatch Front Regional Council 1995 estimates. 2000 based on 1996 Utah Workforce Services actual. Wikstrom Economic & Planning.
Note: Information based on traffic zones within the study area.

**TABLE 3.5-3**
**WEST-EAST CORRIDOR—RACE AS % POPULATION**

| | White | African American | Native American | Hispanic Origin | Other |
|---|---|---|---|---|---|
| Airport | 95.9% | 0.7% | 0.7% | 1.9% | 0.9% |
| North Temple | 73.7% | 3.8% | 2.6% | 13.3% | 6.7% |
| Downtown | 86.0% | 1.9% | 2.8% | 4.2% | 5.2% |
| 400 South | 90.1% | 1.4% | 1.6% | 2.3% | 4.6% |
| University | 82.0% | 1.3% | 1.0% | 1.1% | 14.6% |
| Total | 84.0% | 2.1% | 1.9% | 5.5% | 6.5% |
| Salt Lake City | 87.0% | 1.7% | 1.6% | 5.0% | 4.8% |
| Salt Lake County | 93.0% | 0.8% | 0.8% | 2.6% | 2.8% |

Source: Wikstrom Economic & Planning Consultants; 1990 Census Bureau.
Note: Information is compiled by proportion of census tract associated with the study area.

**TABLE 3.5-4**
**WEST-EAST CORRIDOR**
**DWELLING UNITS 1990-2020**

| | 1990 | 1995 | 2000 | 2005 | 2010 | 2015 | 2020 |
|---|---|---|---|---|---|---|---|
| Airport | 47 | 48 | 48 | 123 | 198 | 273 | 348 |
| North Temple | 5,237 | 5,233 | 5,329 | 7,363 | 9,399 | 11,436 | 13,472 |
| Downtown | 4,003 | 4,061 | 4,176 | 4,189 | 4,222 | 4,235 | 4,243 |
| 400 South | 16,023 | 15,773 | 16,038 | 16,213 | 16,338 | 16,563 | 16,738 |
| University | 1,520 | 1,709 | 1,903 | 3,134 | 3,134 | 3,134 | 3,134 |
| Total Corridor | 26,830 | 26,824 | 27,494 | 31,022 | 33,291 | 35,641 | 37,935 |
| Salt Lake City | 73,751 | 75,240 | 76,995 | 78,614 | 80,861 | 82,534 | 82,996 |
| Salt Lake County | 258,404 | 284,588 | 306,571 | 344,934 | 379,607 | 426,661 | 459,430 |

Source: Wikstrom Economic and Planning; Wasatch Front Regional Council.

| Table 3.5-5<br>WEST-EAST CORRIDOR<br>EMPLOYMENT 1990-2020 | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **1990** | **1995** | **2000** | **2005** | **2010** | **2015** | **2020** |
| Airport * | 19,910 | 22,722 | 27,080 | 29,877 | 33,073 | 35,679 | 38,297 |
| North Temple | 6,812 | 7,898 | 10,304 | 15,211 | 20,118 | 25,025 | 29,932 |
| Downtown | 47,866 | 46,582 | 51,682 | 53,078 | 54,672 | 56,282 | 57,952 |
| 400 South | 32,603 | 37,127 | 41,397 | 42,581 | 43,885 | 45,255 | 46,538 |
| University** | 22,363 | 24,781 | 25,200 | 26,077 | 27,069 | 28,053 | 28,989 |
| Total Corridor | 129,554 | 139,110 | 155,663 | 166,824 | 178,817 | 190,294 | 201,708 |
| Salt Lake City | 189,081 | 206,734 | 221,133 | 234,442 | 250,398 | 265,303 | 279,635 |
| Salt Lake County | 369,278 | 438,798 | 484,242 | 530,617 | 582,882 | 635,477 | 684,786 |

Source: Wasatch Front Regional Council 1995 estimates. 2000 based on 1996 Utah Workforce Services actual. Wikstrom Economic & Planning.

Note: Information based on traffic zones within the study area. Employment figures are exclusive of agricultural and construction jobs.

* Includes International Center

** Includes Research Park

# 3.6 AFFECTED ECOSYSTEMS: VEGETATION, WILDLIFE, AND THREATENED OR ENDANGERED SPECIES

This section describes potentially affected vegetation, wildlife and endangered/threatened species in the West-East Corridor. Because the study corridor encompasses urban, industrial and agricultural areas in addition to salt marshes, uplands and foothills, a wide variety of species may be affected.

## 3.6.1 Vegetation

Vegetation resources within the project area for the proposed transit project were mapped from aerial photographs taken on March 20, 1998. Vegetation and other natural cover types identified from the photographs were verified during reconnaissance visits to the project area on May 7 and May 8, 1998 and June 15, 1998. Dominant plant species were identified for each vegetation type and the general level of disturbance characteristic of each vegetation and natural cover type was noted.

Eight distinct vegetation and natural cover types were identified from aerial photographs of and reconnaissance visits to the West-East Corridor (see Figures 5.8-1 through 5.8-5). Those vegetation and cover types are shown in Table 3.6-1.

| TABLE 3.6-1<br>VEGETATION TYPES SUBJECT TO DIRECT IMPACT FROM<br>THE PROPOSED PROJECT | |
|---|---|
| **Vegetation Type** | **Acreage in Study Corridor** |
| Marsh | 0.55 |
| Wet Meadow | 3.1 |
| Open Water | 0.61 |
| Aquatic bed | 0.08 |
| Common Reed (*Phragmites*) stands | 1.24 |
| Upland Meadow (weedy) | 3.55 |
| Landscaped Upland | 1.18 |

Marsh and wet meadow qualify as jurisdictional wetlands. The areas supporting stands of common reed usually qualify as jurisdictional wetlands, although stands may expand into upland areas by vegetative reproduction. Open water, aquatic bed, and unvegetated playa qualify as waters of the United States, but not as jurisdictional wetlands due to a lack of vegetation. Weedy upland meadow and landscaped upland are uplands.

The marsh vegetation type occupies 0.55 acre within the area to be potentially impacted by the West-East LRT Alternative. Most of the marsh areas support dense stands of primarily cattails (*Typha latifolia*), but two of the marsh areas consist of stands of hardstem bulrush (*Scirpus acutus*). The wet meadow area located near the west end of North Temple is dominated by foxtail barley (*Hordeum jubatum*), western wheatgrass (*Pascopyrum smithii*), curly dock (*Rumex crispus*), and saltgrass (*Distichlis spicata*). Vegetation cover is less than 75 percent, with the unvegetated portions covered by algal mats and litter early in the growing season. Most of the wet meadow areas located west of the eastern crossing of the Surplus Canal are heavily dominated by saltgrass, with a few scattered patches of wiregrass (*Juncus arcticus*), creeping spikerush (*Eleocharis palustris*), foxtail barley, and rarely Olney threesquare (*Scirpus americanus*). Near the interface with adjacent upland areas, weedy species, such as whitetop (*Cardaria draba*), perennial sowthistle (*Sonchus arvensis*), dandelion (*Taraxacum officinale*), and alfalfa (*Medicago sativa*), are often present in the canopy but never common. Both the marsh and wet meadow vegetation types have been invaded in several locations by common reed.

The stands of common reed within the proposed transit project corridor are expanding to replace marsh and wet meadow vegetation. Within the wetland areas, the stands of common reed are extremely dense, with few individuals of other species. In places, these stands have expanded into adjacent upland areas by vegetative reproduction. In the upland areas dominated by common reed, an understory of upland weeds, commonly whitetop, increases in cover.

The open water areas depicted in Figures 5.8-1 through 5.8-5 represent the portions of the project area that were inundated on March 20, 1998 when the aerial photographs from which the map was made were taken. The area depicted as aquatic bed represents portions of the project area that were not inundated on the photo date, but which are subject to prolonged inundation during the growing season. Most of the aquatic bed areas had become inundated by the beginning of May and remained inundated through June, 1998. It is likely that fluctuations of water level are characteristic of the open water areas within the proposed transit corridor and that those fluctuations are responsible for the lack of vascular and emergent vegetation usually associated with shallow water bodies.

The wetland vegetation types and the cover types qualifying as waters of the U.S. are described in more detail in Section 3.7.

Most of the remainder of the proposed transit corridor west of the west end of North Temple supports weedy upland vegetation. Dominant plant species include smooth brome (*Bromus inermis*), western wheatgrass, crested wheatgrass (*Agropyron desertorum*), bulbous bluegrass (*Poa bulbosa*), Mediterranean barley, yellow-blossom sweetclover (*Melilotus officinalis*), cheatgrass, crane's bill (*Erodium cicutarium*), whitetop, clasping pepperweed (*Lepidium perfoliatum*), dandelion, etc. In some areas, plant species typical of right-of-way seed mixes, such as tall wheatgrass (*Elymus elongatus*) and alkali sacaton (*Sporobolus airoides*), are important in the canopy. Much of the area included in the weedy upland meadow vegetation type appears to have been filled in the past.

The West-East Corridor is occupied by landscaped upland vegetation within portions of the Salt Lake City International Airport property on the west end, and on the east end where the proposed alignment is located adjacent to South Campus Drive, Wasatch Boulevard, and Medical Drive. The landscaped upland area on airport property consists of a variety of shrubs and small trees surrounded by bark mulch. Some of the plant species present include aspen (*Populus tremuloides*) and shrub cinquefoil (*Potentilla fruticosa*). On the east end of the corridor, the landscaped upland areas consist of lawns, with scattered ornamental and shade trees. Tree species include Austrian pine (*Pinus nigra*), green ash (*Fraxinus pennsylvanica*), honey locust (*Gleditsia triacanthos*), blue spruce (*Picea pungens*), elm (*Ulmus americana*), linden (*Tilia americana*), maple (*Acer* spp.), and varieties of flowering ornamental trees (*Rosaceae*).

The remainder of the proposed alignment for the West-East LRT Alternative is located in the center of existing streets. No vegetation resources, excluding street trees and landscaping, are present within the proposed corridor between the west end of North Temple and South Campus Drive.

### 3.6.2 Wildlife

The Utah Division of Wildlife Resources (UDWR) and the U.S. Fish and Wildlife Service (USFWS) have jurisdiction over wildlife of all species. UDWR has expressed concern about impacts to wetlands and uplands, and have agreed to coordinate with the study team to ensure that development of mitigation plans (if applicable) will enhance wildlife habitat. Coordination with USFWS has occurred. The USFWS has expressed concern during the DEIS process about impacts to listed threatened and endangered species (which are covered below in section 3.6.3).

**Regional Habitats:** On a regional level, plant and animal habitat is most prevalent in the Great Salt Lake to the northwest, and in the foothill region on the east, because these areas are not fully developed and create ideal environments for wildlife. Areas north and northwest of the corridor are comprised of mud flats and marsh lands and serve as resting area for migratory birds and nesting area for waterfowl. The Wasatch foothill region serves as a winter habitat for many animals that migrate to cooler, higher mountain elevations during summer months.

Prominent avian species within the Great Salt Lake marshlands include loons, grebes, ducks, geese, herons, ibis, plovers, sandpipers, phalaropes, gulls and terns. Raptors frequent uplands and marshland habitat. Peregrine falcon sightings occur regularly in the downtown area near Main Street and South Temple.

Mammals of the Great Salt Lake area include a variety of species of shrews, bats, rabbits, squirrels, gophers, mice, rats, beaver, porcupines, coyotes, foxes, weasels, black bears, badgers, skunks, ringtails, bobcats/cougar, elk and mule deer. Similar to the avian species, the availability of natural habitat for food and shelter shapes the population size. In the Great Salt Lake area fish species include: trout, carp, chubs, suckers, bass and sunfish. Within the study boundary, fish habitat was identified for the mountain whitefish, the Utah sucker and the redside shiner in the Jordan River.

Amphibians and reptiles play an important role in wetland ecosystems. They often are the predators within an ecosystem and can prevent population explosions of their prey. Reptile species in the Great Salt Lake area include: turtles, lizards and snakes. Amphibians include a variety of salamanders, toads and frogs.

**Project Corridor Habitats:** In general, habitat areas immediately surrounding the project area contribute very little to the population viability of any wildlife species in the Salt Lake Valley. Much of the proposed LRT alignment is located within the middle of existing roads and has minimal habitat quality for wildlife. However, areas of suitable wildlife habitat exist on both the west and east ends of the corridor. Eight types of vegetation in the corridor have been discussed previously in Section 3.6.1. All types occur along the western portion of the corridor (west of North Temple), while the eastern portion of the corridor (east of Rice-Eccles Stadium) contains only landscaped upland.

On the west end of the project, the corridor passes through open fields and small wetlands. These areas provide habitat for a variety of birds and a few species of mammals, reptiles, and amphibians. The wetlands are the most valuable habitats and enhance the value of the adjacent uplands. In turn, the open spaces provided by the uplands enhances the value of the wetlands. These wetland areas appear to be subject to fluctuating water levels which do not necessarily reduce value to some wildlife species, and may enhance value for other species. The habitat quality of the project corridor is relatively low where it passes through upland areas due to nearby roads with high traffic volumes and plant species of rather low wildlife value. Portions of the proposed LRT alignment are adjacent to the Wing Pointe Golf Course, which has low wildlife value. The route passes over the Surplus Canal which provides some foraging opportunities (fish and flying invertebrates) for some species of birds.

The small areas of playa near the north end of the line, just south of the airport provide seasonal foraging areas for shorebirds. The water source for this area is surface runoff from adjacent lands, and is limited by rainfall and snow melt events. When standing water is present, this area can provide some habitat for a variety of shorebirds. Much of this land is slated for future development.

On the east end of the project, the proposed LRT alignment parallels Medical Drive and Wasatch Boulevard within the University of Utah campus. This area is primarily landscaped, containing lawns and some large trees. The lawns provide some foraging areas for a few species of passerine birds, while the large trees may provide nesting, foraging, and protective cover for a variety of birds. The overall quality of this habitat is low for wildlife, with urban species dominant.

**Affected Wildlife Resources:** Three groups of vertebrate wildlife that may use the project area were reviewed. This information was compiled from site visits, habitat evaluation and pertinent literature (Kaufman 1996, Cox and Tanner 1995, UDWR 1990, Zeveloff and Collet 1988, Behle et al. 1985, Ryser 1985, Walters and Sorensen 1983, Stebbins 1966, Hurt and Grossenheider 1964). The compiled lists of wildlife species include those observed using the project area or adjacent areas of similar habitat, and those for which suitable habitat occurs on the project site. Species which may use the project area very infrequently (less than once per year) were generally not included in these lists. Input from the U.S. Fish and Wildlife Service (USFWS) and Utah Division of Wildlife Resources (UDWR) was also used in describing the affected resources.

*Avian fauna* - A variety of bird species may use the project corridor (Table 3.6-2). This list includes waterfowl, waders, shorebirds, raptors and passerines. Of these species, however, very few would be expected to nest within the project area because of low habitat quality or limited habitat extent. Mallards were observed with young on one marsh pond during the on-site surveys. Most use of the project area would be for foraging or resting. Ring-necked pheasant is the only upland avian game species expected to be regular on the project area.

Use by shorebirds is dictated by the availability of standing water within the small playa areas near the airport. This occurs primarily in the spring after snow melt or after significant rainfall. Waterfowl use is limited by the availability of standing water in the small marsh ponds south of the airport. Use of the western portion of the project area by raptors is limited by the lack of suitable roosting or nesting sites, and the high volume of traffic adjacent to much of the route. In the eastern section, foraging would be limited with the extensive lawn cover.

*Mammalian fauna* - Up to 24 species of mammals may use the project area (Table 3.6-3). Most of these species would be infrequent users of the project area due to limited suitable habitat and poor habitat quality. Rodents are the most common species. The adjacency of the airport and high traffic volume roads along the western portion of the project corridor provide substantial barriers to movement of mammalian species into and out of the project area, further reducing habitat quality for mammals. Extensive landscaping on the east end of the project area limits cover and foraging habitat for most species of mammals.

*Reptiles and amphibians* - Five amphibian and four reptile species may use the project area (Table 3.6-4). Tiger salamanders in the small marshes are likely the most common amphibian, while garter snakes are probably the most common reptile. Chorus frogs were heard in the marsh areas during the survey periods. The adjacency of the airport and high traffic volume roads along the western portion of the project corridor provide substantial barriers to movement of these species into and out of the project area. Extensive landscaping on the east end of the project area limits cover and foraging habitat for most reptiles and amphibians.

| TABLE 3.6-2<br>AVIAN FAUNA THAT MAY USE THE PROJECT AREA | | | |
|---|---|---|---|
| **Common Name** | **Scientific Name** | **Location** | **Status** |
| Pied-billed Grebe | *Podilymbus podiceps* | west of North Temple | year around visitor |
| Eared Grebe | *Podiceps nigricollis* | west of North Temple | spring or fall migrant |
| Great Blue Heron | *Ardea herodias* | west of North Temple | year around visitor |
| Snowy Egret | *Egretta thula* | west of North Temple | summer visitor |
| Cattle Egret | *Bubulcus ibis* | west of North Temple | summer visitor |
| White-faced Ibis | *Plegadis chihi* | west of North Temple | summer visitor |
| Canada Goose | *Branta canadensis* | west of North Temple | year around visitor |
| Green-winged Teal | *Anas crecca* | west of North Temple | spring or fall migrant |
| Mallard | *Anas platyrhynchos* | west of North Temple | year around visitor |
| Northern Pintail | *Anas acuta* | west of North Temple | spring or fall migrant |
| Cinnamon Teal | *Anas cyanoptera* | west of North Temple | summer visitor |
| Northern Shoveler | *Anas clypeata* | west of North Temple | year around visitor |
| Gadwall | *Anas strepera* | west of North Temple | year around visitor |
| American Wigeon | *Anas americana* | west of North Temple | spring or fall migrant |
| Redhead | *Aythya americana* | west of North Temple | spring or fall migrant |
| Ring-necked Duck | *Aythya collaris* | west of North Temple | spring or fall migrant |
| Lesser Scaup | *Aythya affinis* | west of North Temple | spring or fall migrant |
| Common Goldeneye | *Bucephala clangula* | west of North Temple | spring or fall migrant |
| Bufflehead | *Bucephala albeola* | west of North Temple | spring or fall migrant |
| Ruddy Duck | *Oxyura jamaicensis* | west of North Temple | summer visitor |
| Turkey Vulture | *Cathartes aura* | west of North Temple | summer visitor |
| Northern Harrier | *Circus cyaneus* | west of North Temple | year around visitor |
| Sharp-shinned Hawk | *Accipiter striatus* | east of Rice-Eccles Stadium | winter visitor |
| Swainson's Hawk | *Buteo swainsoni* | west of North Temple | summer visitor |
| Red-tailed Hawk | *Buteo jamaicensis* | west of North Temple, east of Rice-Eccles Stadium | year around visitor |
| Rough-legged Hawk | *Buteo lagopus* | west of North Temple | winter visitor |
| American Kestrel | *Falco sparverius* | west of North Temple, east of Rice-Eccles Stadium | year around visitor |
| Ring-necked Pheasant | *Phasianus colchicus* | west of North Temple | year around visitor |
| Virginia Rail | *Rallus limicola* | west of North Temple | summer visitor |
| Sora | *Porzana carolina* | west of North Temple | summer visitor |
| American Coot | *Fulica americana* | west of North Temple | year around visitor |
| Killdeer | *Charadrius vociferus* | west of North Temple | summer visitor |
| Black-necked Stilt | *Himantopus mexicanus* | west of North Temple | summer visitor |
| American Avocet | *Recurvirostra americana* | west of North Temple | summer visitor |
| Greater Yellowlegs | *Tringa melanoleuca* | west of North Temple | spring or fall migrant |
| Lesser Yellowlegs | *Tringa flavipes* | west of North Temple | spring or fall migrant |
| Willet | *Catoptrophorus semipalmatus* | west of North Temple | summer visitor |
| Spotted Sandpiper | *Actitis macularia* | west of North Temple | summer visitor |
| Long-billed Curlew | *Numenius americanus* | west of North Temple | spring or fall migrant |
| Marbled Godwit | *Limosa fedoa* | west of North Temple | spring or fall migrant |
| Western Sandpiper | *Calidris mauri* | west of North Temple | spring or fall migrant |

| TABLE 3.6-2<br>AVIAN FAUNA THAT MAY USE THE PROJECT AREA | | | |
|---|---|---|---|
| **Common Name** | **Scientific Name** | **Location** | **Status** |
| Least Sandpiper | *Calidris minutilla* | west of North Temple | spring or fall migrant |
| Long-billed Dowitcher | *Limnodromus scolopaceus* | west of North Temple | spring or fall migrant |
| Common Snipe | *Gallinago gallinago* | west of North Temple | summer visitor |
| Wilson's Phalarope | *Phalaropus tricolor* | west of North Temple | summer visitor |
| Franklin's Gull | *Larus pipixcan* | west of North Temple | summer visitor |
| Ring-billed Gull | *Larus delawarensis* | west of North Temple | year around visitor |
| California Gull | *Larus californicus* | west of North Temple | year around visitor |
| Caspian Tern | *Sterna caspia* | west of North Temple | summer visitor |
| Forster's Tern | *Sterna forsteri* | west of North Temple | summer visitor |
| Rock Dove | *Columba livia* | west of North Temple, east of Rice-Eccles Stadium | year around visitor |
| Mourning Dove | *Zenaida macroura* | west of North Temple, east of Rice-Eccles Stadium | summer visitor |
| Western Screech-Owl | *Otus kennicottii* | east of Rice-Eccles Stadium | year around visitor |
| Great Horned Owl | *Bubo virginianus* | east of Rice-Eccles Stadium | year around visitor |
| Common Nighthawk | *Chordeiles minor* | west of North Temple, east of Rice-Eccles Stadium | summer visitor |
| Black-chinned Hummingbird | *Archilochus alexandri* | east of Rice-Eccles Stadium | summer visitor |
| Calliope Hummingbird | *Stellula calliope* | east of Rice-Eccles Stadium | spring or fall migrant |
| Broad-tailed Hummingbird | *Selasphorus platycercus* | east of Rice-Eccles Stadium | spring or fall migrant |
| Rufous Hummingbird | *Selasphorus rufus* | east of Rice-Eccles Stadium | spring or fall migrant |
| Downy Woodpecker | *Picoides pubescens* | east of Rice-Eccles Stadium | year around visitor |
| Hairy Woodpecker | *Picoides villosus* | east of Rice-Eccles Stadium | winter visitor |
| Northern Flicker | *Colaptes auratus* | east of Rice-Eccles Stadium | year around visitor |
| Western Kingbird | *Tyrannus verticalis* | west of North Temple | summer visitor |
| Horned Lark | *Eremophila alpestris* | west of North Temple | year around visitor |
| Tree Swallow | *Tachycineta bicolor* | west of North Temple | summer visitor |
| Violet-green Swallow | *Tachycineta thalassina* | west of North Temple, east of Rice-Eccles Stadium | summer visitor |
| Northern Rough-winged Swallow | *Stelgidopteryx serripennis* | west of North Temple | summer visitor |
| Bank Swallow | *Riparia riparia* | west of North Temple | summer visitor |
| Cliff Swallow | *Hirundo pyrrhonota* | west of North Temple | summer visitor |
| Barn Swallow | *Hirundo rustica* | west of North Temple, east of Rice-Eccles Stadium | summer visitor |
| Western Scrub Jay | *Aphelocoma californica* | east of Rice-Eccles Stadium | year around visitor |
| Black-billed Magpie | *Pica pica* | west of North Temple, east of Rice-Eccles Stadium | year around visitor |
| Common Raven | *Corvus corax* | west of North Temple | year around visitor |
| Black-capped Chickadee | *Parus atricapillus* | east of Rice-Eccles Stadium | year around visitor |
| Mountain Chickadee | *Parus gambeli* | east of Rice-Eccles Stadium | winter visitor |

**TABLE 3.6-2**
**AVIAN FAUNA THAT MAY USE THE PROJECT AREA**

| Common Name | Scientific Name | Location | Status |
|---|---|---|---|
| Red-breasted Nuthatch | *Sitta canadensis* | east of Rice-Eccles Stadium | winter visitor |
| Northern Shrike | *Lanius excubitor* | west of North Temple | winter visitor |
| Loggerhead Shrike | *Lanius ludovicianus* | west of North Temple | summer visitor |
| European Starling | *Sturnus vulgaris* | west of North Temple, east of Rice-Eccles Stadium | year around visitor |
| Warbling Vireo | *Vireo gilvus* | east of Rice-Eccles Stadium | summer visitor |
| Yellow Warbler | *Dendroica petechia* | east of Rice-Eccles Stadium | summer visitor |
| Yellow-rumped Warbler | *Dendroica coronata* | east of Rice-Eccles Stadium | spring or fall migrant |
| Western Tanager | *Piranga ludoviciana* | east of Rice-Eccles Stadium | spring or fall migrant |
| Black-headed Grosbeak | *Pheucticus melanocephalus* | east of Rice-Eccles Stadium | summer visitor |
| Lazuli Bunting | *Passerina amoena* | east of Rice-Eccles Stadium | summer visitor |
| Rufous-sided Towhee | *Pipilo erythrophthalmus* | east of Rice-Eccles Stadium | year around visitor |
| Chipping Sparrow | *Spizella passerina* | west of North Temple, east of Rice-Eccles Stadium | summer visitor |
| Vesper Sparrow | *Pooecetes gramineus* | west of North Temple | summer visitor |
| Lark Sparrow | *Chondestes grammacus* | west of North Temple | summer visitor |
| Savannah Sparrow | *Passerculus sandwichensis* | west of North Temple | summer visitor |
| Song Sparrow | *Melospiza melodia* | west of North Temple | year around visitor |
| White-crowned Sparrow | *Zonotrichia leucophrys* | west of North Temple | winter visitor |
| Dark-eyed Junco | *Junco hyemalis* | east of Rice-Eccles Stadium | winter visitor |
| Red-winged Blackbird | *Agelaius phoeniceus* | west of North Temple | summer visitor |
| Western Meadowlark | *Sturnella neglecta* | west of North Temple | summer visitor |
| Yellow-headed Blackbird | *Xanthocephalus xanthocephalus* | west of North Temple | summer visitor |
| Brewer's Blackbird | *Euphagus cyanocephalus* | west of North Temple, east of Rice-Eccles Stadium | year around visitor |
| Brown-headed Cowbird | *Molothrus ater* | west of North Temple, east of Rice-Eccles Stadium | summer visitor |
| Bullock's Oriole | *Icterus bullockii* | east of Rice-Eccles Stadium | summer visitor |
| Cassin's Finch | *Carpodacus cassinii* | east of Rice-Eccles Stadium | winter visitor |
| House Finch | *Carpodacus mexicanus* | west of North Temple, east of Rice-Eccles Stadium | year around visitor |
| Pine Siskin | *Carduelis pinus* | east of Rice-Eccles Stadium | winter visitor |
| American Goldfinch | *Carduelis tristis* | west of North Temple, east of Rice-Eccles Stadium | year around visitor |
| Evening Grosbeak | *Coccothraustes vespertinus* | east of Rice-Eccles Stadium | winter visitor |
| House Sparrow | *Passer domesticus* | west of North Temple, east of Rice-Eccles Stadium | year around visitor |

**TABLE 3.6-3**
**MAMMALIAN FAUNA THAT MAY USE THE PROJECT AREA**

| Common Name | Scientific Name | Location |
|---|---|---|
| masked shrew | *Sorex cinereus* | west of North Temple |
| vagrant shrew | *Sorex vagrans* | west of North Temple |
| California myotis | *Myotis californicus* | west of North Temple |
| western small-footed myotis | *Myotis ciliolabrum* | west of North Temple, east of Rice-Eccles Stadium |
| little brown bat | *Myotis lucifugus* | west of North Temple, east of Rice-Eccles Stadium |
| big-brown bat | *Eptesicus fuscus* | west of North Temple, east of Rice-Eccles Stadium |
| Nuttall's cottontail | *Sylvilagus nuttallii* | west of North Temple |
| northern pocket gopher | *Thomomys talpoides* | west of North Temple |
| western harvest mouse | *Reithrodontomys megalotis* | west of North Temple |
| deer mouse | *Peromyscus maniculatus* | west of North Temple, east of Rice-Eccles Stadium |
| meadow vole | *Microtus pennsylvanicus* | west of North Temple |
| montane vole | *Microtus montanus* | west of North Temple |
| long-tailed vole | *Microtus longicaudus* | west of North Temple |
| muskrat | *Ondatra zibethicus* | west of North Temple |
| western jumping mouse | *Zapus princeps* | west of North Temple |
| coyote | *Canis latrans* | west of North Temple |
| red fox | *Vulpes vulpes* | west of North Temple |
| racoon | *Procyon lotor* | west of North Temple |
| short-tailed weasel (ermine) | *Mustela erminea* | west of North Temple |
| long-tailed weasel | *Mustela frenata* | west of North Temple |
| mink | *Mustela vison* | west of North Temple |
| badger | *Taxidea taxus* | west of North Temple |
| striped skunk | *Mephitis mephitis* | west of North Temple, east of Rice-Eccles Stadium |
| mule deer | *Odocoileus hemionus* | west of North Temple, east of Rice-Eccles Stadium |

| TABLE 3.6-4<br>REPTILES AND AMPHIBIANS THAT MAY USE THE PROJECT AREA | | |
|---|---|---|
| **Common Name** | **Scientific Name** | **Location** |
| tiger salamander | *Ambystoma tigrinum* | west of North Temple |
| western toad | *Bufo boreas* | west of North Temple, east of Rice-Eccles Stadium |
| Woodhouse's toad | *Bufo woodhousei* | west of North Temple |
| boreal chorus frog | *Pseudacris triseriata* | west of North Temple |
| leopard frog | *Rana pipiens* | west of North Temple |
| western yellowbelly racer | *Coluber constrictor* | west of North Temple |
| great basin gopher snake | *Pituophis melanoleucus* | west of North Temple |
| red-sided garter snake | *Thamnophis sirtalis* | west of North Temple |
| wandering garter snake | *Thamnophis elegans* | west of North Temple, east of Rice-Eccles Stadium |

### 3.6.3 Threatened and Endangered Species

**Wildlife:** Endangered and threatened species are located within the study corridor. The Utah Division of Wildlife Resources (UDWR) and the U.S. Fish and Wildlife Service (USFWS) have jurisdiction over threatened and endangered species. The following threatened and endangered species occur in Salt Lake County: bald eagle (*Haliaeetus leucocephalus*, threatened) and peregrine falcon (*Falco peregrinus*, endangered). The project area does not contain habitat listed as critical or sensitive for either of these species, and it is very unlikely that the project would have an adverse impact on either of these species.

The USFWS has requested that the transportation corridor avoid the spotted frog (*Rana pretiosa*). This species is listed as a Conservation Species by UDWR, receiving sufficient special management under a Conservation Agreement with the USFWS and UDWR to preclude its listing under the Endangered Species Act.

In addition to the spotted frog, several other species listed by UDWR can occur within Salt Lake City. These species do not have protection under the Endangered Species Act, but may cause the UDWR to request mitigation measures to minimize project impacts. UDWR has classified the ferruginous hawk (*Buteo regalis*) as state threatened. In addition, UDWR has classified the following avian species as special concern species: American white pelican (*Pelecanus erythrorhynchos*), Northern goshawk (*Accipiter gentilis*), Swainson's hawk (*Buteo swainsoni*), Caspian tern (*Sterna caspia*), black tern (*Chlidonias niger*), long-billed curlew (*Numenius americanus*), short-eared owl (*Asio flammeus*), Lewis' woodpecker (*Melanerpes lewis*), common yellowthroat (*Geothlypis trichas*), and yellow-breasted chat (*Icteria virens*). The project area does not contain critical or sensitive habitat for any of these species, and it is very unlikely the project would have any adverse impact to these species. The following is a brief discussion of each of the listed species.

*Bald eagle* - Bald eagle is listed as threatened by the USFWS. This species is a regular winter visitor in the Salt Lake Valley, and has recently nested. Foraging by this species in the valley is primarily on waterfowl and fish. The project area contains little suitable foraging habitat and no roosting trees for this species. Occurrence within the project area would be rare and limited.

*Peregrine falcon* - Peregrine falcon is listed as endangered by the USFWS. Peregrine falcon is a spring and fall migrant through the Salt Lake Valley. This species also breeds within the valley at several locations, primarily associated with hacking towers. In addition, it has been a regular breeder in downtown Salt Lake City. The project area provides little suitable habitat for peregrine falcons and minimal foraging opportunities. Use of the project area by peregrines would be very limited and occur very rarely. In addition, construction and operation of the project is not likely to adversely affect nesting birds in the downtown areas.

*Ferruginous hawk* - This species is listed as a Utah threatened species by the UDWR. Ferruginous hawk is a permanent resident in the western, drier portions of the Salt Lake Valley. The project area is east of the primary habitat for this species, and use of the project area would be limited to very infrequent visits.

*Swainson's hawk* - Swainson's hawk is listed as a Utah species of special concern due to declining populations. It is a regular breeder in the Salt Lake Valley. The project area contains some suitable habitat for this species for foraging, but the lack of large trees eliminates the possibility of nesting within the project area. Use of the area would likely be limited due to the distance from roosting and nesting trees.

*Short-eared owl* - Short-eared owl is listed as a Utah species of special concern due to declining populations. It is a permanent resident of the Salt Lake Valley although the population has declined in recent years. The project area contains some suitable foraging habitat for this species, but does not contain suitable nesting habitat. Because extensive suitable habitat does not occur near the project area, use by this species would be expected to be very limited.

*Long-billed curlew* - Long-billed curlew is listed as a Utah species of special concern due to declining populations and limited distribution. It is a regular breeder in the Salt Lake Valley. The project area does not contain suitable habitat for long-billed curlew nesting, but the small playa areas could provide limited foraging when standing water is present.

*Caspian tern* - Caspian tern is listed as a Utah species of special concern due to declining population. It is a limited breeder in the Salt Lake Valley, and is an uncommon summer resident. The project area does not contain suitable habitat for this species, but it may use the Surplus Canal for occasional foraging.

*Black tern* - Black tern is listed as a Utah species of special concern due to declining population. This species nests in extensive marshes along the Great Salt Lake. The project area does not contain suitable habitat for this species, but it may use the Surplus Canal for occasional foraging.

*Lewis' woodpecker* - This species is listed as a Utah species of special concern due to declining populations and limited distribution. Formerly this species was rather common in the Salt Lake Valley, but is now primarily a rare winter visitor. Population declines are blamed on the spread of the European starling (*Sturnus vulgaris*) which has preempted nesting sites in holes in large trees. The east end of the project area contains some large trees that are proposed to be removed that might provide cover and foraging for this species. However, use of these trees would be very limited and not on a regular or annual basis.

*Common yellowthroat* - Common yellowthroat is listed as a Utah species of special concern due to declining population. This species nests in bulrush and cattail marshes. The project area contains some small marshes that could provide some nesting habitat for this species. However no individuals were observed during the on-site visits. Lack of use of habitat on the site may be due to fluctuating water levels, limited extent of marsh vegetation and/or high traffic volumes adjacent to the marshes. Wetland mitigation measures should offset any loss of habitat for this species.

*Other bird species* - An additional four species of wildlife regularly occur in Salt Lake County that are Utah sensitive species: American white pelican, osprey, northern goshawk, and yellow-breasted chat. None of these species would be expected to use the project area as suitable habitat does not exist. In addition, the project area is not adjacent to suitable habitat for any of these species.

*Spotted frog* - The spotted frog (*Rana pretiosa*) is listed as a conservation species by the Utah Division of Wildlife Resources. This species is highly aquatic, preferring cold, permanent water, and inhabits shallow, spring or creek-fed marshes. The marshes in the project area are maintained by runoff water from adjacent lands and fluctuate widely in depth over the course of the year. These marshes do not provide suitable habitat for this species, nor are they near suitable habitat.

The Utah Natural Heritage Program also noted that the flammulated owl (*Otus flammeolus*) is designated as "sensitive" by Region Four of the United States Department of Agriculture (USDA) Forest Service.

**Plants:** Plants of special concern in the project area include Ute ladies' tresses orchid (*Spiranthes diluvialis*), which is listed as Threatened by the USFWS, and Wasatch jamesia (*Jamesia americana* var. *macrocalyx*), which is designated as "sensitive" by Region Four of the United States Department of Agriculture (USDA) Forest Service.

Neither the Ute ladies' tresses orchid or Wasatch jamesia is anticipated to be impacted by the project due to a lack of suitable habitat in the impact area. The wetlands on the west end of the proposed transit corridor are unsuitable habitat for the Ute ladies' tresses orchid due to saline soil conditions and dense stands of saltgrass and common reed. The east end of the proposed transit corridor does not include suitable habitat for the Wasatch jamesia due to landscaping activities. The transit project will not result in any impacts to either of the plant species of special concern or to any suitable habitat for these species.

## 3.7 WETLANDS

Wetlands are defined as "Waters of the United States" and are protected by Section 404 of the Clean Water Act. Wetlands may not be altered without a permit from the U.S. Army Corps of Engineers (COE). Although the COE prefers avoidance of wetlands if at all possible, they do allow permits when application demonstrates mitigation of impacts to a wetland either directly or indirectly. Wetlands are identified based on soils, hydrology and hydrophytic vegetation.

A primary source of wetland data was the National Wetland Inventory Maps (NWI) created by the U.S. Fish and Wildlife Service (USFWS). Soils in the corridor are unsurveyed; however, the soils in the western part of the corridor are primarily of the Decker-Lasil-Terminal and the Chipman-Magna-Ironton associations. These poorly drained soils occur on lake plains and flood plains. Data on wetlands and soils was supplemented by field visits where wetlands were delineated.

The delineation identified the extent and distribution of jurisdictional wetlands and waters of the United States that could potentially be disturbed by the project. To qualify as a jurisdictional wetland, the vegetation, soil and hydrology (water regime) of a site must meet the criteria specified in the COE Wetlands Delineation Manual (USACE-EL, 1987). (A detailed description of the criteria for vegetation, soil, and hydrology and sampling methods are found in the Wetland Delineation Report found in Appendix C). The boundaries of areas determined to qualify as jurisdictional wetlands were flagged in the field following verification by a COE representative. The flagged areas were then surveyed to show the areas listed on Figure 3.7-1.

Due to the primarily urban nature of the study corridor, the wetland delineation study focused principally on the west end of the project area between SLCIA and the west end of North Temple (at approximately 2400 West), where the corridor is located in open fields and Interstate highway right of way that could qualify as jurisdictional wetlands or waters of the U.S. (See Figure 3.7-1). Between the west end of North Temple and the intersection of 1300 East and 400 South, the corridor is located in the middle of existing streets with no potential areas of jurisdictional wetlands or waters of the U.S. Along Medical Drive and Wasatch Boulevard in the vicinity of the University of Utah and Fort Douglas, the corridor includes landscaped areas associated with buildings, with no potential areas of jurisdictional wetlands or waters of the U.S.

Since the final width of potential disturbance had not been determined when the delineation was performed, the area evaluated within highway right of way extended from the toe of the road fill associated with the airport access road and the fence delimiting the edge of the Wing Pointe Golf Course. On the SLCIA property, the final alignment was not yet defined, but it was known that the corridor would be located within a zone 50 feet wide adjacent to the airport access road to the point where the first exit ramp diverges from the airport access road. This zone was evaluated for the presence of wetlands. North of the first exit ramp from the airport access road, the alignment is located within landscaped airport facilities with no potential to qualify as jurisdictional wetlands or waters of the U.S.

Jurisdictional wetlands within the project area (as shown in Figure 3.7-1) include a shallowly concave area that collects runoff from surrounding filled areas near the west end of North Temple and a nearly continuous linear area along the airport access road between the two bridges spanning the Surplus Canal. Waters of the U.S. include unvegetated areas subject to seasonal and intermittent inundation adjacent to the airport access road.

**Shallowly concave area near the west end of North Temple:** This jurisdictional wetland area was observed to be inundated by snow melt and runoff for several weeks during the early spring (March and April). During field visits in early May, only the lowest portions of this area remained saturated to the soil surface, but evidence of earlier inundation was observed in algal crusts and matted litter comprising as much as 40 percent of surface cover. The area delineated as jurisdictional wetland is surrounded by areas subject to past deposition of up to two feet of fill, and it is apparent that surface runoff from these filled areas accumulates in the unfilled, concave area. Therefore, the area designated as jurisdictional wetland is subject to hydrologic conditions adequate to qualify as wetland hydrology at least seasonally.

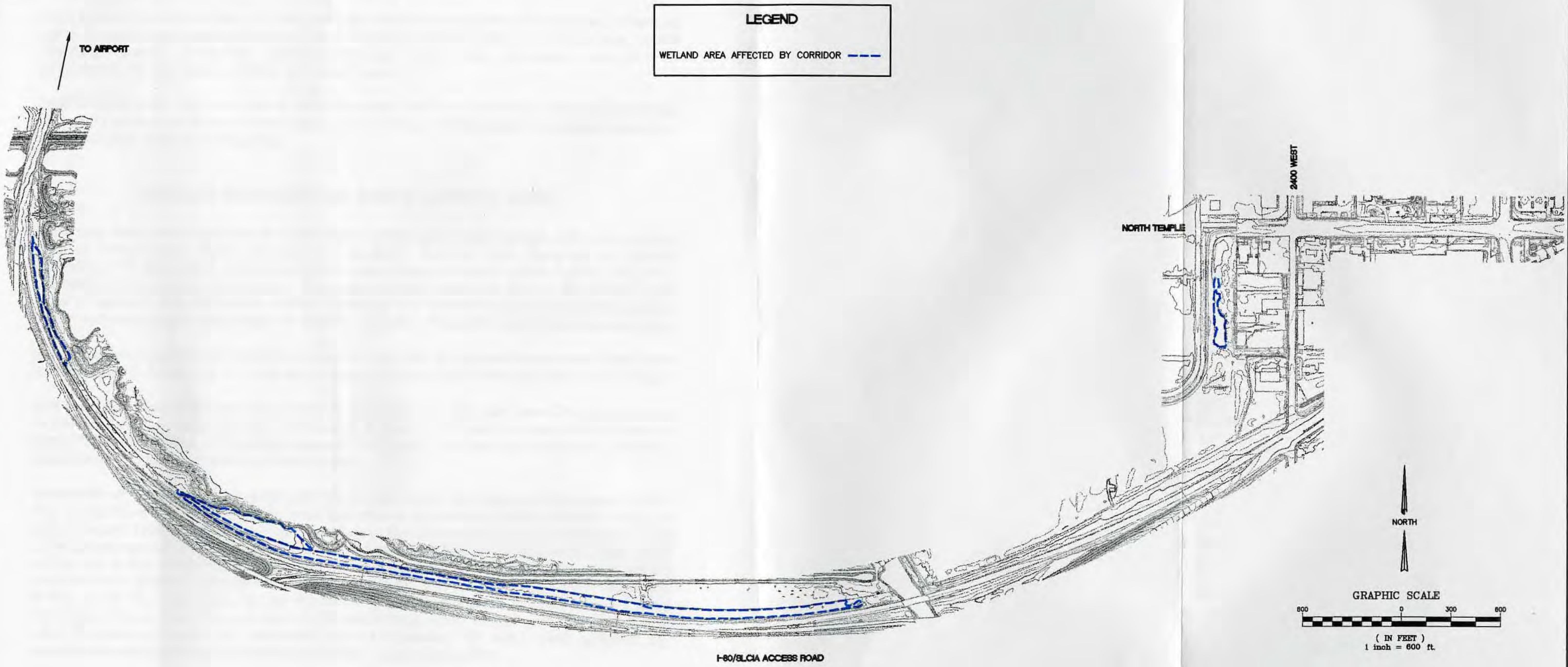
Observations of soils in this area suggest that the soils are subject to inundation due to precipitation and surface runoff. Soils were observed to be saturated and gleyed only within the surface layer. A strong odor reminiscent of landfill conditions was also noted in association with surface soils. Subsoil layers were observed to be not saturated, with a redder chroma and a coarser texture more representative of the native soil type for the area. These observations suggest that a relatively fine-textured soil (or fill layer) on the surface of the area designated as jurisdictional wetland is adequate to induce ponding seasonally or intermittently in association with precipitation and augmentation by surface runoff from surrounding filled areas. The type of wetland represented in this area is wet meadow, or palustrine emergent wetland as classified in the Cowardin system (Cowardin, et al., 1979).

**Area between the two bridges over the Surplus Canal:** Most of the UDOT right of way between the toe of the airport access road fill and the fence that delimiting the edge of the Wing Pointe Golf Course qualifies as jurisdictional wetland. Wetlands delineated along the airport access road include wet meadow and marsh, both of which are qualified by Cowardin, et al. (1979) as palustrine persistent emergent wetland. The wet meadow portions of the jurisdictional wetland area are dominated by saltgrass (*Distichlis spicata*), with small stands of wiregrass (*Juncus arcticus*), common reed (*Phragmites australis*), and creeping spikerush (*Eleocharis palustris*) located in slightly wetter sites within the wetland. The marsh portions of the jurisdictional wetland area are dominated by cattail (*Typha latifolia*), with widespread invasion by common reed and small patches of Olney threesquare (*Scirpus americanus*). The areas occupied by shallow open water without vegetation are classified by Cowardin, et al. (1979) as palustrine aquatic bed or palustrine unconsolidated bottom wetlands.

Soils within the area designated as jurisdictional wetland between the two bridges exhibit various types of evidence of past deposition of fill material. In the central portion of the wetland, coarse soils indicate that road base or other fill had been deposited within the right of way or migrated from adjacent road fill. At such locations, indicators of hydric soil conditions were absent despite hydrophytic vegetation and wetland hydrology. Near the east and northwest ends of the wetland area, evidence of fill deposition was absent, but indicators of hydric soil conditions were present. It was determined that all areas within the highway right of way that are dominated by saltgrass are characterized by hydric soil conditions, even though indicators of these hydric conditions may not have developed because of alteration or filling.

Delineation Conducted By:
Cindy Johnson/Ramona Rukavina
Natural Resources Consulting
135 East Center
Logan, Utah 84321
(435) 752-4200
5/7 - 5/8/98

Property Owner:
Salt Lake City International Airport

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# West-East Corridor FEIS
# Wetlands in Study Corridor

Figure 3.7-1

Wetlands in Study Corridor

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Since the airport access road right of way in this area is concave and lower than the road surface, roadway runoff accumulates in the right of way. In addition, the water surface elevation in the Surplus Canal is higher than the surface elevation within the right of way. Seepage from the canal is apparently an additional source of water to the plant communities in the right of way, particularly where the canal is located close to the right of way. Evidence of wetland hydrology, including oxidized rhizospheres and saturated soils was observed at most sample locations within the right of way west of the Surplus Canal.

Areas between the two bridges not designated as jurisdictional wetlands are occupied by several feet of fill material and are dominated by upland weeds, including whitetop (*Cardaria draba*), alfalfa (*Medicago sativa*), cheatgrass (*Bromus tectorum*), and barley (*Hordeum leporinum, H. geniculatum*), except near sprinklers on the golf course.

**Total wetland area:** The total area of wetlands located within the area to be potentially impacted by the LRT project is 4.89 acres (see Figure 3.7-1). Section 5.8 discusses the wetland impacts of the project and anticipated mitigation.

## 3.8 WATER RESOURCES AND FLOODPLAINS

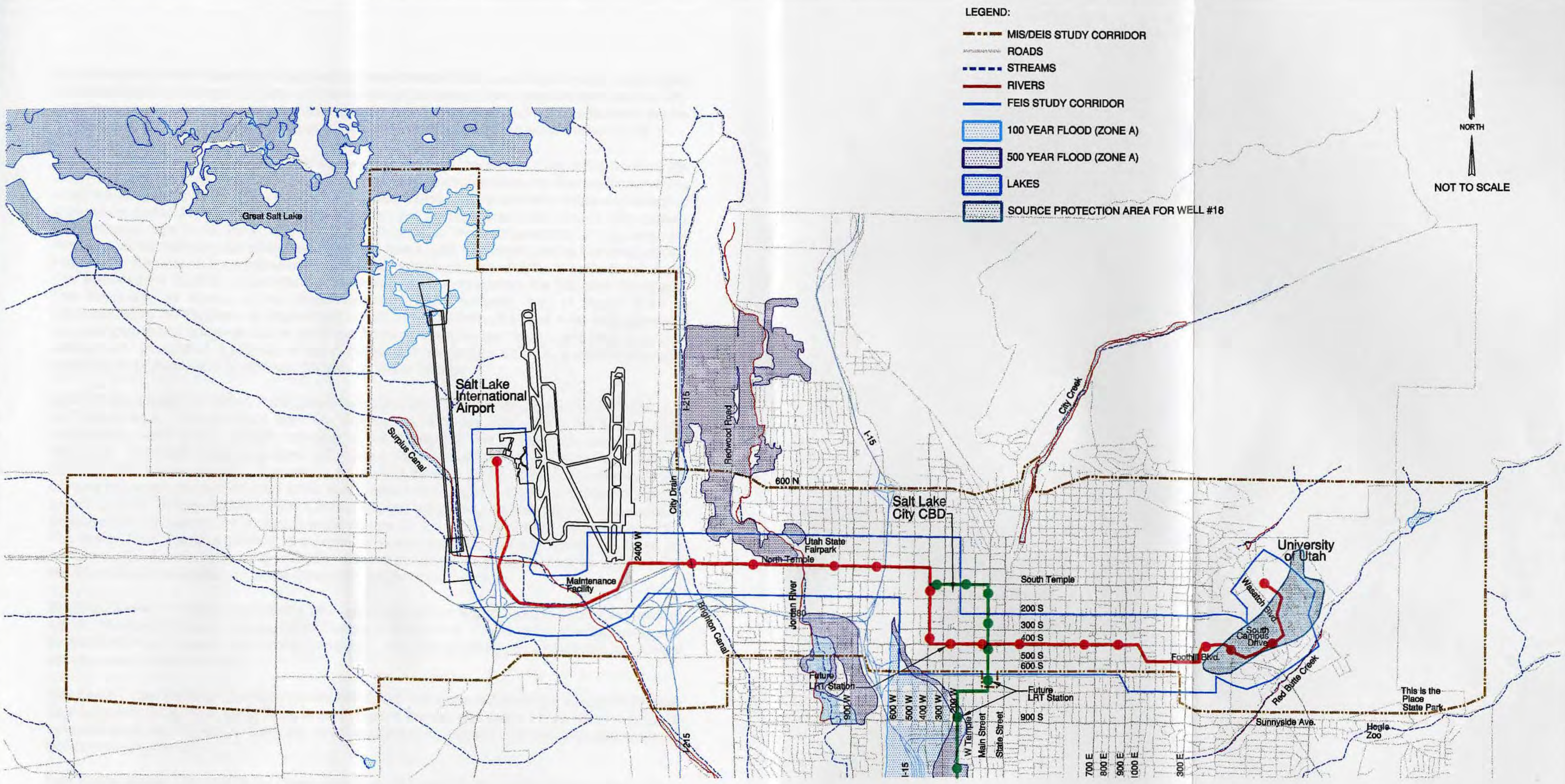
In general, water resources include surface and underground water courses and water bodies, such as lakes, ponds, rivers, streams, and aquifers. Surface water resources are usually associated with floodplains, which include the areas adjacent to water bodies that are subject to inundation during periods of high water. The quality of water resources greatly affects the habitat value of wetlands and can impact wildlife, vegetation, and threatened and endangered species. Water resources supply clean water for industry, irrigation, recreation, and human consumption.

Existing water resources and floodplain locations within the project corridor are described below and illustrated in Figure 3.8-1. There are no sole source aquifers within the West-East Corridor.

**Salt Lake City Well #18:** This well is a source of drinking water for Salt Lake City, and is owned by the Salt Lake City Water System. The source of water for this well is an aquifer confined at a depth of 266 to 470 feet. The well is located at 500 South/1500 East and the source protection area extends under the University of Utah campus.

**Jordan River:** The Jordan River is the only natural watercourse that intersects the project corridor. The Jordan River flows from south to north and crosses the project corridor at North Temple at approximately 1200 West. The annual mean flow of the Jordan River in the project area is 145 cubic feet per second (cfs). The maximum flow recorded was 449 cfs on August 20, 1986. Most of the flow in the Jordan River is diverted into the Surplus Canal to the south of the project boundary in an attempt to alleviate flooding problems in the area south of 2100 South. The waters of the Jordan River are classified for the following beneficial uses: 2B, 3B, 3D, and 4 (from Farmington Bay to North Temple) and 2B, 3B, and 4 (from North Temple to the confluence with Little Cottonwood Creek). (2B: secondary contact recreation, 3B: warm water fisheries, 3D: waterfowl/shorebirds/other water-oriented wildlife, 4: agricultural uses).

The 100-year floodplain for the Jordan River, as shown in Figure 3.8-1, is contained by channel banks. The 500-year floodplain for the Jordan River extends to near the project corridor along the north side of North Temple, and is confined to the floodplain south of North Temple. Flooding along the lower Jordan River is common during periods of high seasonal runoff and cloudburst activity.

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West-East Corridor FEIS
Water Resources and Floodplains

Figure 3.8-1



slc_cadd\W-ELRT\FEIS\AUTOCAD\FEIS_WATER.DWG R07 01.14.99

The floodplain is administered by Engineering Department of Salt Lake City through a local flood ordinance and any changes to bridge structures along the Jordan River must not increase the 100-year food event more than one vertical foot. In addition, if alterations are to be made to the stream or bank, a stream-alteration permit must be submitted to the Utah Division of Water Rights.

**Surplus Canal:** The Surplus Canal carries excess water from the Jordan River to the south of the SLCIA and then north to the Great Salt Lake. The study corridor crosses the Surplus Canal at two locations along the airport access road. The Surplus Canal was constructed to alleviate flooding in the lower Jordan River area south of 2100 South. The average flow in the canal is 371 cfs and the maximum flow in the canal was 4,410 cfs on June 1, 1984. The waters of the canal are classified for the following beneficial uses: 3B, 3D, and 4. (2B: secondary contact recreation, 3B: warm water fisheries, 3D: waterfowl/shorebirds/other water-oriented wildlife, 4: agricultural uses). The banks of the Surplus Canal create a levee that completely contain the 500-year floodplain. The floodplain, as shown on the Water Resource and Floodplain map in Figure 3.8-1 is administered by the Engineering Department of Salt Lake City through a local flood ordinance and any changes to this bridge structure must not increase the 100-year flood event more than one vertical foot. In addition, if alterations are to be made to the stream or bank, a stream-alteration permit must be submitted to the Utah Division of Water Rights.

**North Point Canal:** The North Point Canal conveys water from the Surplus Canal to the west of the project area. The diversion from the Surplus Canal to the North Point Canal is located immediately north of the eastern crossing of the Surplus Canal through the proposed LRT alignment. The North Point Canal does not intersect the proposed project corridor at that location, however, it flows immediately adjacent to the project corridor to the west of the diversion and crosses the project corridor adjacent to the northwestern crossing of the Surplus Canal through the project corridor. Where the North Point Canal is located adjacent to the corridor, it is apparent that seepage from the canal is an important water source for the wetlands located within the corridor. The North Point Canal is located at a higher elevation than the Surplus Canal and lacks an associated floodplain. Any changes in alignment of the North Point Canal must be approved by the North Point Consolidated Canals Company, which owns the canal.

**Brighton Canal:** The Brighton Canal is an irrigation canal that is also used to control stormwater runoff. The Brighton Canal crosses North Temple at 2200 West. The Brighton Canal is operated by the North Point Consolidated Canals Company. Any changes that may impact this canal must be approved by this company.

**City Drain:** The City Drain conveys stormwater runoff that does not enter the Jordan River from approximately 2400 West North Temple north toward the sewage canal. There is no floodplain associated with the City Drain. Salt Lake City has jurisdiction over this drain and any changes must be approved by the City.

**Red Butte Creek:** The Red Butte Creek runs from northeast of the project corridor through the University of Utah campus and eventually into Liberty Park. The proposed LRT alignment does not cross the creek directly, but runs within several blocks of the creek. The average flow for this creek is 4.23 cfs, with a maximum flow of 105 cfs on May 28, 1993. A dam, approximately 1.5 miles upstream from the University campus, forms Red Butte Reservoir. As the creek enters the valley, the channel alternates between above-ground and below-ground sections. The conduits are sized to contain a 500-year flood. In the open channel sections of the stream, the 500-year floodplain is approximately 50 feet on either side of the creek centerline.

**Shallow groundwater:** Shallow groundwater is found throughout the project area. Groundwater under the Salt Lake Valley consists of a deep unconfined aquifer near the mountains, a confined (artesian) aquifer and shallow unconfined aquifer overlying the confined aquifer and locally unconfined or perched aquifers. Less permeable layers of silt and clay overlie the confined aquifer, but the thickness, continuity and permeability of these confining layers vary with location. Groundwater in the deep unconfined and confined aquifers is used for public supply in many parts of the valley. (USGS 1992) The shallow unconfined aquifer is located very close to the surface within the westernmost portions of the project corridor. It is apparent that shallow groundwater is an important source of hydrology to the wetlands located within the project corridor to the west of the eastern crossing of the Surplus Canal.

## 3.9 TRANSPORTATION

The following section describes the existing roadway functional classifications and volume-to-capacity ratios (v/c) on the streets and highways within the corridor. The Existing Transit Conditions section describes UTA's existing mass transit systems within the study area. Existing bus routes are presented along with their frequencies and ridership information. The Bicycle Facilities section describes existing and proposed bicycle routes within the study area. The Freight-Railroad Operations section presents existing railroad operations and locations of railroad spurs; the Passenger Rail section presents existing Amtrak schedules.

### 3.9.1 Streets and Highways

The West-East Corridor contains a variety of streets and highways offering different levels of service and capacities (See Figure 3.9-1). Three major freeways serve the corridor. Interstate 15 (I-15), which is the highest volume roadway in the state, runs north-south through the Salt Lake valley and delivers large volumes of traffic into the center of the corridor from both directions. It is a major access route to and from downtown and serves traffic traveling to the SLCIA and the University of Utah as well. Traffic is also delivered into the west and east sides of the corridor from the south by Interstate 215 (I-215), a belt route that encircles Salt Lake City on the west, east and south sides. Finally, the corridor contains Interstate 80 (I-80), which is located within the study area on the west side of I-15 and lies outside, but parallel to the study area on the east side of I-15. I-80 is the major west-east highway corridor through the Salt Lake area and serves as the principal access route to the airport.

The corridor also contains seven principal arterials. The only ones running west-east are 500 South and 600 South, both one-way streets that provide the major access to downtown from I-15. Running north-south, five principal arterials carry traffic to and through the corridor. Bangerter Highway and 5600 West serve downtown and the airport from the south central part of the city. Both 700 East and State Street serve downtown and University from the south. Foothill Boulevard, which connects to 400 South/500 South, serves as a principal arterial for traffic from Southeast Salt Lake County.

Other important west-east streets include North Temple, a minor arterial, which serves the areas west of downtown to the airport and 400 South and South Temple streets, both minor arterials, which provide access to the University of Utah on the east side of the corridor. Several north-south streets are important as well, such as Redwood Road, 300 West, and West Temple. These are minor arterials that deliver traffic into downtown from the South, and 1300 East, which is a minor arterial that delivers substantial traffic to the University from the south.

**Existing Roadway Classifications**
In transportation planning, roadway facilities are grouped according to their functional classification. At one extreme are high speed, high-volume facilities carrying through traffic, with no access to abutting properties. At the other, are local rural roads or streets that carry low volumes, sometimes at low speeds and with a primary function of land service. Road classifications were obtained from UDOT's Functional Classification map. The following highway facilities are classified as arterial or higher (see Figure 3.9-1).

| **Interstate** | **Maximum Number of Lanes** |
|---|---|
| I-15 | 8 |
| I-215 | 8 |
| I-80 | 6/8 |
| **Principal Arterial** | **Maximum Number of Lanes** |
| Bangerter | 4 |
| 700 East | 8 |
| 500 South | 4 |
| 600 South | 4 |
| Foothill Blvd/400 S | 6 |
| Redwood Road | 6 |
| **Minor Arterial** | **Maximum Number of Lanes** |
| State Street | 6 |
| 300 West | 6 |
| 1300 East | 4 |
| North Temple | 6 |
| 400 South | 6 |
| 800South | 4 |
| North Temple | 6 |

**West-East Corridor Streets Studied**
Several roadways with volumes sufficient to significantly impact west-east travel were selected to represent overall conditions in the corridor. They are shown in Figure 3-9.1 with their respective functional classifications.

- North Temple
- 400 South
- 500 South
- 600 South
- I-80 via I-15 from the (CBD)
- Bangerter Highway (north-south roadway)

- Redwood Road (north-south arterial)
- Interstate-15 (north-south highway)
- 300 West (north-south street)

**Arterial Street Cross Sections in Proposed Corridor**
The existing lane configuration of the West-East Corridor is summarized in Table 3.9-1.

**Table 3.9-1**
**West-East Corridor**
**Existing Lane Configuration**

| Street Name | From | To | Number of Through Lanes |
|---|---|---|---|
| North Temple | I-80 | 900 West | 6* |
| North Temple | 900 West | 400 West | 6 |
| 400 West | North Temple | 400 South | 4 |
| 400 South/500 South | 400 West | 1300 East/500 South | 6 |
| University Avenue | 500 South | 400 South | 1 (one way) |
| South Campus Drive | 1300 East | Wasatch Drive | 4 |
| Wasatch Drive | South Campus Drive | South Medical Drive | 6 |
| South Medical Drive | Wasatch Drive | Terminus | 4 |

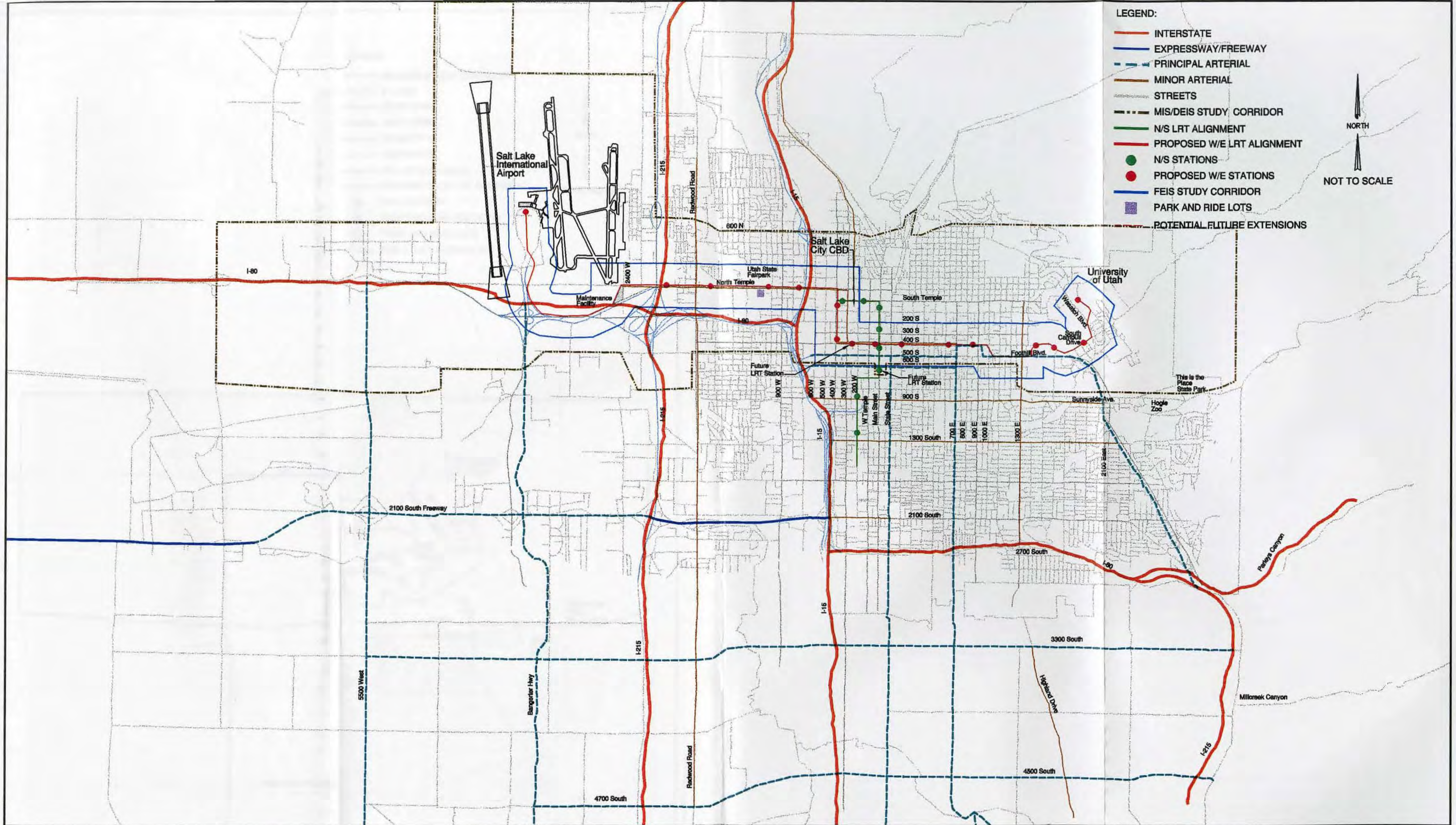
*Currently re-striped for 6 lanes during I-80 reconstruction.

**Roadway Traffic Volumes**
Current traffic volumes were obtained from Traffic on Utah Highways 1996, produced by UDOT. Figures 3.9-2 and 3.9-3 show, respectively, 1997 and 2020 screening counts for corridor roadways.

**Roadway Volume to Capacity (v/c)**
A summary of the results of the v/c analysis for key intersections is provided in Table 3.9-2. The traffic volumes utilized in the analysis were obtained from Traffic on Utah Highways, 1996. The PM peak hour traffic volumes were assumed to be 10 percent of the daily volumes given from Traffic on Utah Highways, 1996. The directional distribution for each roadway in the intersections was taken to be 50 percent in each direction. Only through-lanes were considered in this analysis. Any turning lanes were ignored for the purposes of this study.

Analysis of the selected intersections identified the congested (worse than LOS D) intersections along the West-East Corridor. Existing intersection geometries were obtained from either Salt Lake City or a field survey of each intersection.

The methodology assumes that the capacity of each through-lane for an intersection was assumed to be 900 vehicles per hour (vph). This value is considered typical for signalized intersections in the area, but may vary according to signal timing. The volume- to-capacity ratio (v/c ratio) is the measured volume on a particular traffic lane divided by the capacity (in this case 900 vph). For example, a lane used to full capacity would have a v/c ratio of 1.0. Lane groupings with v/c ratios over 1.0 are assumed to be operating "above capacity".

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## West-East Corridor FEIS
## Area Roadway Network

Figure 3.9-1

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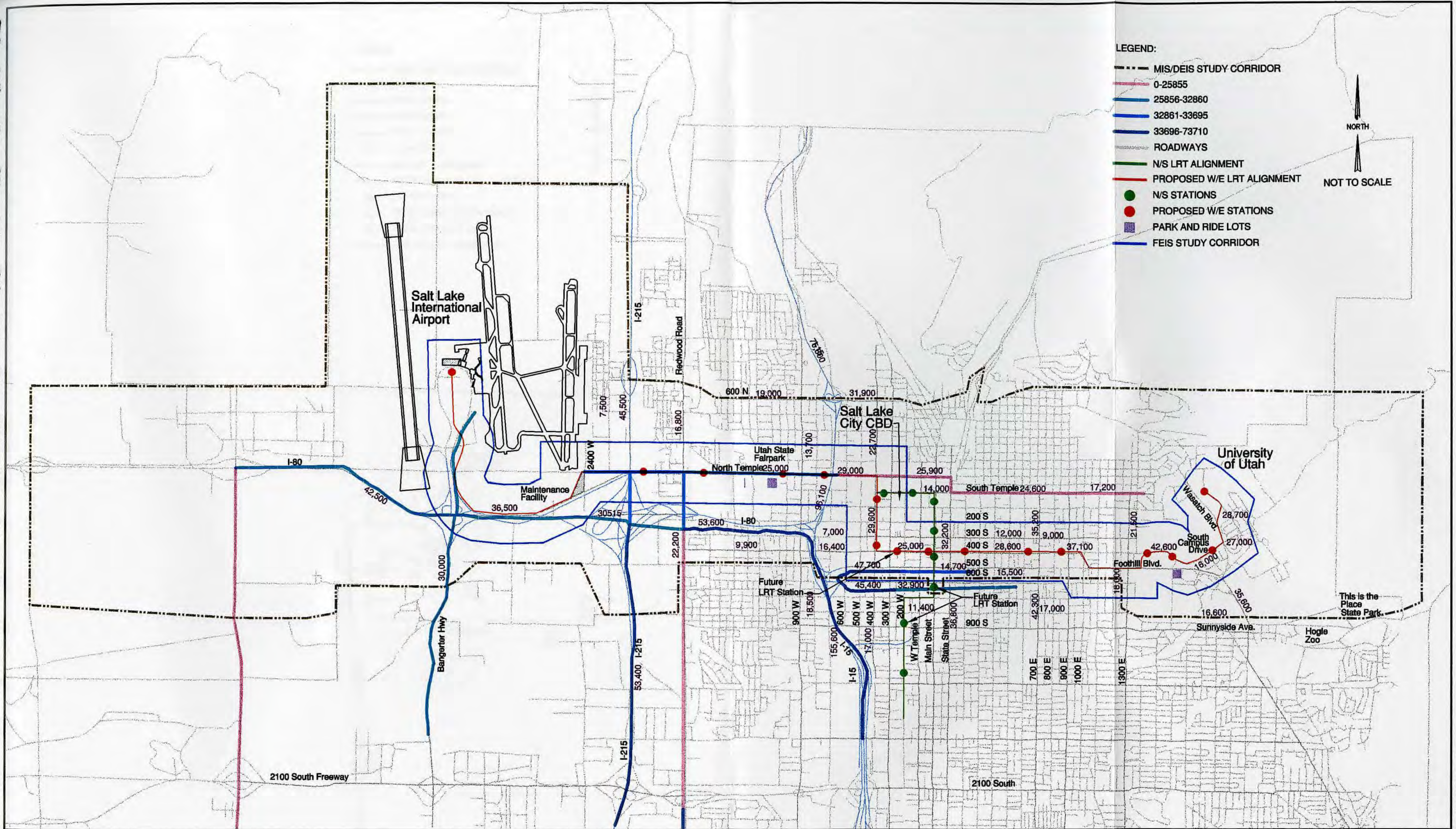


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West East Corridor FEIS
1995 ADT Screenline Traffic Counts

Figure 3.9-2

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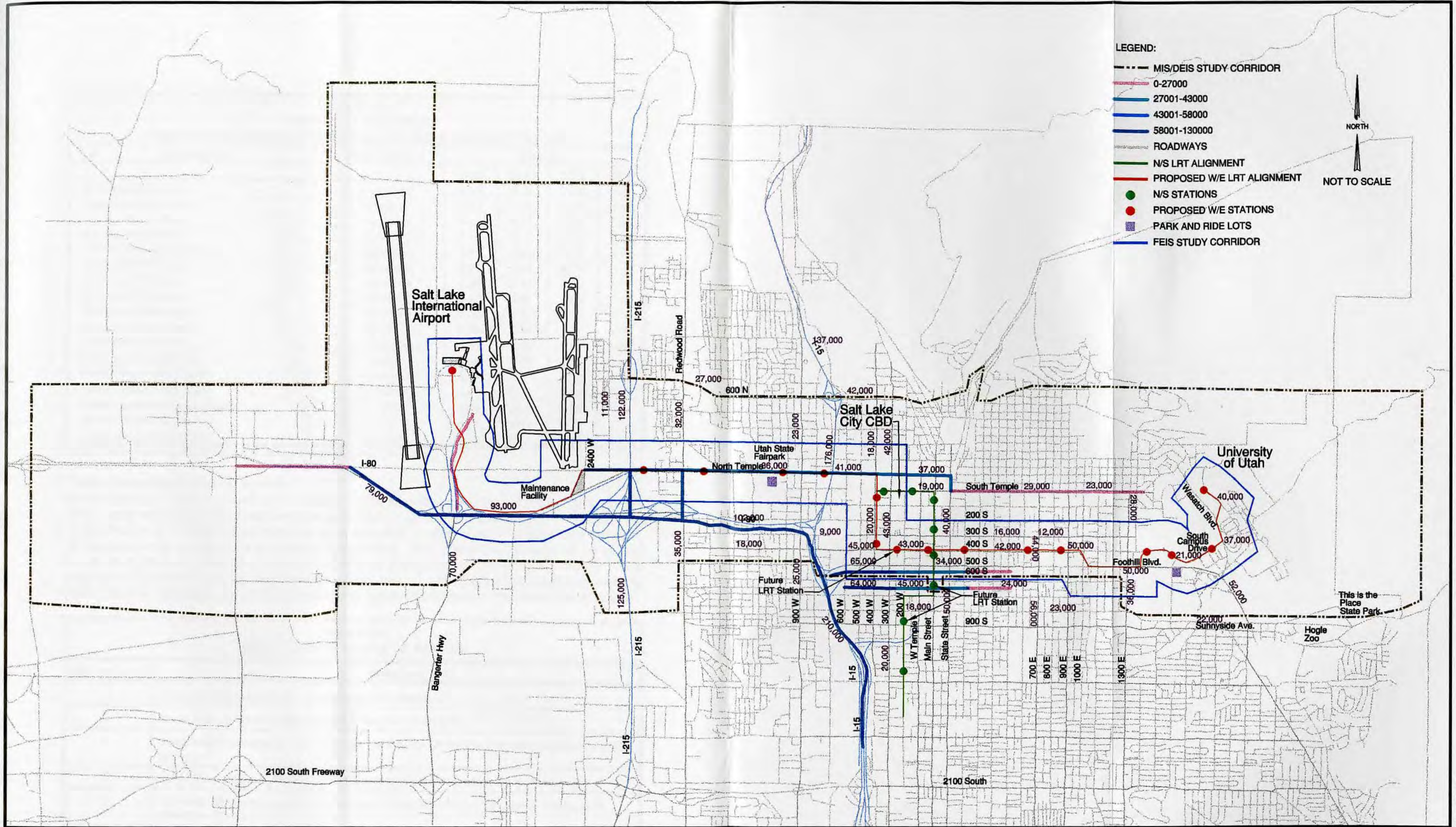


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West-East Corridor FEIS
2020 ADT Screenline Traffic Counts
with 200 South HOV

Figure 3.9-3

| TABLE 3.9-2<br>WEST-EAST CORRIDOR<br>1996 PM PEAK - HOUR INTERSECTION VOLUME TO CAPACITY RATIO | | | | | |
|---|---|---|---|---|---|
| **Intersection** | **Signal Status** | **v/c Ratio** | | | |
| | | North | South | East | West |
| 600 South\200 West | Signalized | 0.25 | 0.33 | 0.86 | N/A |
| 300 South\State Street | Signalized | 0.54 | 0.54 | 0.48 | 0.48 |
| 400 South\300 West | Signalized | 0.51 | 0.51 | 0.35 | 0.35 |
| 400 South\700 East | Signalized | 0.78 | 0.78 | 0.59 | 0.59 |
| 400 South\Redwood Road | Signalized | 0.61 | 0.61 | 0.32 | 0.32 |
| 500 South\1300 East | Signalized | 0.48 | 0.48 | 0.77 | 0.77 |
| 500 South\700 East | Signalized | 0.58 | 0.58 | 0.39 | 0.39 |
| 500 South\300 West | Signalized | 0.40 | 0.40 | N/A | 0.62 |
| 500 South\State Street | Signalized | 0.62 | 0.62 | 0.4 | N/A |
| 600 South\State Street | Signalized | 0.54 | 0.54 | N/A | 0.47 |
| 1580 East\500 South | Signalized | 0.41 | 0.41 | **1.15** | **1.15** |
| North Temple\300 West | Signalized | 0.39 | 0.39 | 0.53 | 0.53 |
| North Temple\Main Street | Signalized | 0.37 | 0.37 | 0.79 | 0.79 |
| North Temple\State Street | Signalized | 0.41 | 0.41 | **1.38** | 0.69 |
| North Temple\Redwood Road | Signalized | 0.29 | 0.29 | 0.86 | 0.86 |
| South Temple\700 East | Signalized | N/A | N/A | 0.77 | 0.77 |
| South Temple\State Street | Signalized | 0.82 | 0.54 | 0.44 | 0.66 |

(Note: Values in bold indicate v/c > 1.0, meaning over-capacity conditions.)

## Traffic Operations Level of Service

Level of service (LOS) is a qualitative measure of the operating conditions within a traffic system which represents how those conditions are perceived by drivers and passengers. The LOSs are ranked from A to F with A representing the most desirable conditions and F representing the least. An explanation for each LOS is provided in Table 3.9-3. This qualitative measure will be utilized to provide a basis of comparison between the different alternatives discussed in this section. This method of comparison coupled with others provided later should offer the information required to make informed decisions concerning the future of transportation within the West-East Corridor.

| Table 3.9-3<br>DEFINITIONS OF LEVELS OF SERVICE | |
|---|---|
| **Service Level** | **Definitions** |
| A | Free flow - Users unaffected by others in traffic stream. |
| B | Stable flow - Slight decline in freedom to maneuver from LOS A. |
| C | Stable flow - Operation of users becomes significantly affected by interaction of others in traffic system. |
| D | Stable flow - High density speed and freedom to maneuver is extremely difficult. |
| E | Operating conditions are at or near capacity. All speeds are low, freedom to maneuver is extremely difficult. |
| F | Point at which arrival flow exceeds discharge flow and causes a queue to form. |

Source: *Highway Capacity Manual*, Special report 209, page 1-3, 1-4, 1985

Using the standard Highway Capacity Manual (HCM) software, 12 intersections in the study area were evaluated for existing traffic operations LOS during the PM peak hour. The intersections analyzed and results obtained are summarized in Table 3.9-4. With 12 intersections included in the analysis and 12 turning movements at each intersection, there are a total of 144 (12 x 12) movements that were analyzed. The industry standard is to consider traffic operations at LOS level D or better as acceptable during peak hour conditions. As illustrated in Table 3.9-5, there were only 13 turning movements out of 144 that operate today with traffic flow worse than LOS D. All of these deficiencies occurred for left turn lanes at intersections. TSM improvements should be considered at these intersections in order to reduce or eliminate this deficiency.

Under existing peak hour conditions, there is a wide variance in level of service (LOS) at existing key intersections. Many operate at LOS C or better with average delay ranging from 3.0 to 21.4 seconds. Some operate at LOS D with average delay of 30.0 or higher. The LOS at five of the intersections analyzed was found to be so deficient that the average delay could not be calculated using standard analysis procedures.

**TABLE 3.9-4**
**WEST-EAST CORRIDOR EXISTING PM PEAK HOUR LEVELS OF SERVICE**

| Intersection | Northbound | | | Southbound | | | Eastbound | | | Westbound | | | Overall | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | Left | Thru | Right | LOS | Delay |
| N Temple/Redwood Rd | D | D | D | D | C | C | E | D | D | * | D | D | * | * |
| 400 South/400 West | A | A | A | A | A | A | B | B | B | B | B | B | A | 3.0 |
| 400 South/300 West | C | B | B | B | B | B | B | B | B | B | B | B | B | 11.2 |
| 400 South/200 West | C | B | B | C | C | A | A | A | A | A | A | A | B | 9.7 |
| 400 South/West Temple | * | B | B | B | B | B | E | B | B | * | B | B | * | * |
| 400 South/Main Street | B | B | B | B | C | B | D | B | B | D | B | B | B | 13.7 |
| 400 South/State Street | D | C | C | C | B | B | B | C | C | C | D | C | C | 20.8 |
| 400 South/200 East | B | B | B | B | B | B | E | B | B | * | B | B | * | * |
| 400 South/400 East | B | B | B | B | B | B | * | B | B | * | B | B | * | * |
| 400 South/700 East | E | C | C | D | D | B | C | D | D | E | D | D | D | 34.5 |
| 400 South/900 East | * | B | B | F | B | B | * | B | B | * | B | B | * | * |
| 500 South/1300 East | C | C | C | C | C | B | C | C | C | D | C | C | C | 21.4 |

Source: EWP - conducted traffic counts
*Indicates the V/C is greater than one (over capacity). Delay calculation is meaningless

### 3.9.2 Existing Transit Conditions

Existing transit information was obtained from UTA. In 1997, 24.1 million passengers rode approximately 430 UTA buses for a total of 63.5 million passenger miles within UTA's service area. UTA operates local and express bus service, six days a week on most local routes. In Salt Lake County the majority of local routes operate every 20 to 30 minutes on weekdays. Express and limited routes provide between 1 and 11 daily round trips per day. Figures 3.9-4 and 3.9-5 show bus routes and roadways in the study corridor. Average weekly bus ridership numbers are shown in Table 3.9-5, while Table 3.9-6 shows a summary of the existing bus routes in the project area, with weekday and Saturday frequencies.

Over the past 10 years, ridership on buses operating in the corridor has increased. From 1985 to 1995, ridership on west side corridor routes increased 28.3 percent, an average increase of 2.5 percent per year. During the same time period, ridership on the east side corridor routes increased 11.5 percent, an average increase of just over one percent per year.

Because of congestion, travel times have increased in the corridor as well. From 1985 to 1995, scheduled travel times for buses between downtown and SLCIA have increased 25.9 percent. During the same time period, scheduled travel times for buses between downtown and the University of Utah have increased 6.6 percent.

During 1998, major changes in the transit system are planned, many of which will affect operations in the corridor. The realignment of routes is being studied in two phases. The first phase will comprehensively analyze the routing structure on the west side of Salt Lake County. The second phase will do the same on the east side. The study for the west side indicates a need for increased frequency of service between downtown and SLCIA. In addition, express service to the International Center is being studied. On the east side, streets served by multiple routes are being analyzed to provide better spacing between buses on each route. Numerous other realignments and frequency adjustment scenarios are being analyzed that are intended to improve service within the corridor. Further changes in service are anticipated once the North-South light rail is constructed.

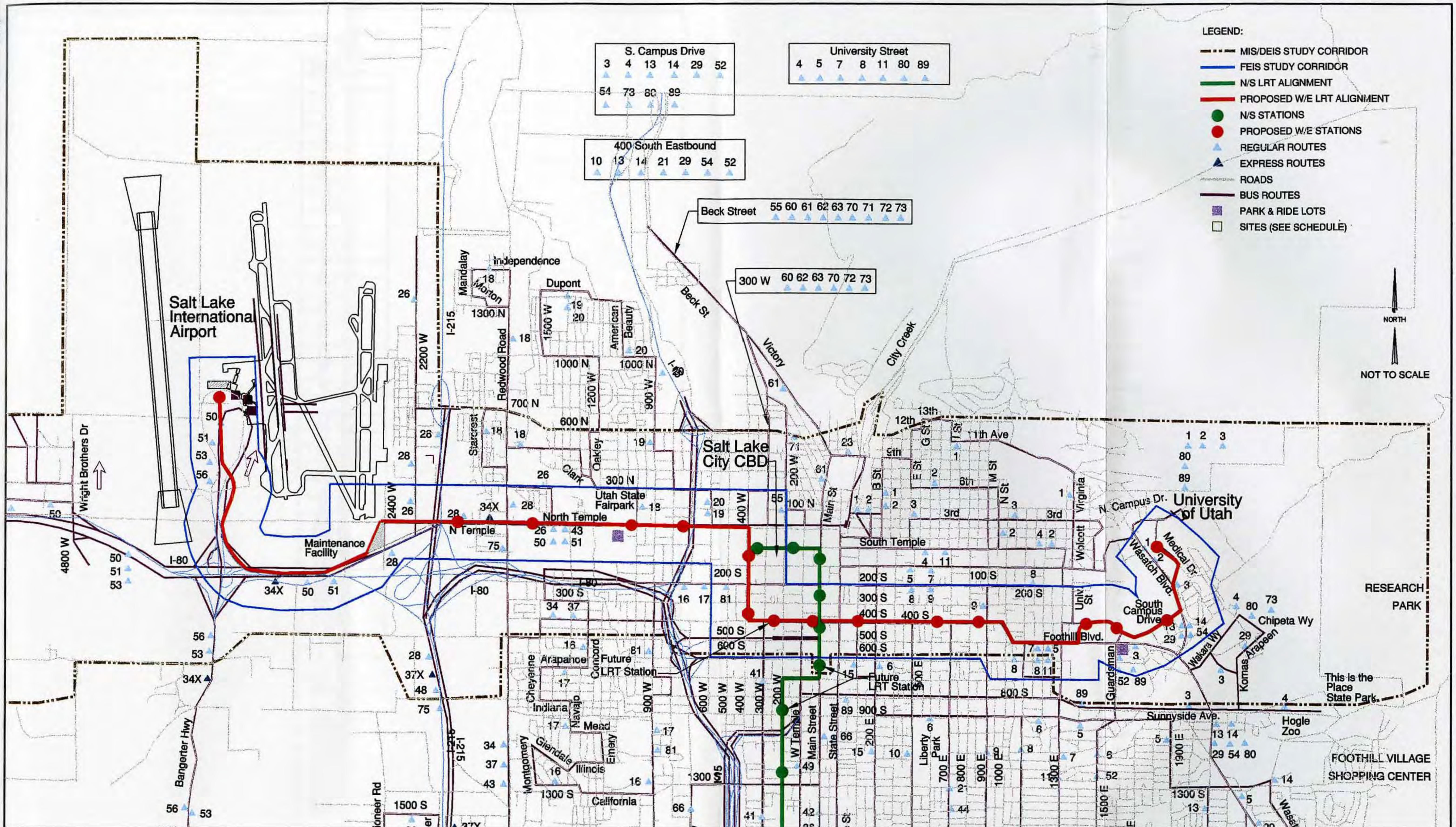
In the Salt Lake area, most of UTA's routes focus on bringing patrons to the downtown area. Additionally, downtown is the interface point for many routes in the UTA system. No routes travel the entire West-East Corridor between the Airport and the University of Utah. However, there are several routes that connect the airport and the University with downtown Salt Lake City. Route 50 runs from downtown Salt Lake City along North Temple to the airport and International Center. Routes 18, 19, 20, 26 and 43 travel from downtown Salt Lake City along North Temple and serve the west side of Salt Lake City. Routes 13, 14, 29, 52 and 54 run along 400 South. Routes 1, 2, 3, and 4 run from downtown Salt Lake City through the Avenues area and South Temple to the University of Utah.

| Table 3.9-5<br>Current UTA Bus Ridership in Corridor Area* | |
|---|---|
| Route # | 1998 Average Weekly Ridership |
| 1 | 535 |
| 2 | 700 |
| 3 | 1336 |
| 4 | 1405 |
| 13 | 492 |
| 14 | 659 |
| 29 | 429 |
| 52 | 1118 |
| 54 | 103 |
| 18 | 1239 |
| 19 | 794 |
| 20 | 693 |
| 43 | 2398 |
| 50 | 1123 |
| 51 | 1035 |
| 52 | 6320 |
| 53 | 355 |
| 56 | 1870 |

* These are the total ridership numbers. Ridership numbers solely in the corridor are not available.

Local service bus routes make stops at regular intervals along their routes, with the spacing of stops of between one-quarter mile to every two to three blocks. Limited service routes operate mostly during peak travel hours and make less frequent stops than local routes, with typical spacing between stops of between one-quarter and one-half mile. Express bus routes operate mostly in peak hours and travel non-stop to downtown Salt Lake City or other key destinations after making passenger pick-ups in outlying collection areas. Currently UTA is filling new express buses to capacity as soon as they are added to the system. Flextrans, UTA's specialized transit for the disabled, also operates in the West-East Corridor. However, there is no set routing, as Flextrans service provides individually routed service for it's riders.

Planned major investments in roadway and transit capacity in the Salt Lake Valley will offer an opportunity for improved transit service in the southern portion of the UTA service area, including travelers from Provo to Salt Lake City, as well as for travel within Salt Lake County. UTA is currently constructing a light rail line to be located along the former Union Pacific Railroad Provo sub right-of-way from 10000 South in Sandy to downtown Salt Lake City. Also, the reconstruction of I-15 will include new bus/HOV lanes into downtown Salt Lake City. Express bus routes coming from the southern portion of the region can be routed to connect with the light rail line in Sandy, or to use the Bus/HOV lanes on I-15. Bus routes and schedules will be modified to coordinate with the light rail line. UTA is currently preparing plans for specific bus route and schedule changes to be implemented when the light rail line opens in 2000.

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# West-East Corridor FEIS
# Existing Bus Routes 1 of 2

Figure 3.9-4

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# SITE SCHEDULE

| Note | Description |
|---|---|
| A | Southwest Airlines Reservation Center |
| B | Boeing |
| C | Air National Guard |
| D | FAA |
| E | Unisys |
| F | State Tax Commission & Dept. of Air Quality |
| G | Utah Department of Agriculture |
| H | Utah Department of Health |
| I | Northwest Multipurpose Center |
| J | Utah State Fair Park |
| K | Mountain Fuel |
| L | State Capitol |
| M | LDS Hospital |
| N | Children's Museum of Utah |
| O | Salt Lake Regional Medical Center |
| P | Shriners Hospital |
| Q | Primary Children's Hospital |
| R | University Hospital |
| S | Utah Museum of Natural History |
| T | Red Butte Gardens |
| U | Veterans Hospital |
| V | Hogle Zoo |
| W | Foothill Village Shopping Center |
| X | Salt Lake Community College, South City Campus |
| Y | Salt Lake County Complex |
| Z | Olympus Hills Shopping Center |
| AA | Cottonwood Corp. Center |
| BB | Whitmore Library |
| CC | Wheeler Historic Farm |
| DD | Cottonwood Mall |
| EE | Fashion Place Mall |
| FF | Cottonwood Hospital |
| GG | Murray City Hall |
| HH | University of Phoenix |
| II | St. Marks Hospital |
| JJ | Brickyard Plaza |
| KK | "E" Center |
| LL | UTA Office Building |
| MM | Salt Lake Community College |
| NN | West Valley City Hall |
| OO | Pioneer Valley Hospital |
| PP | Valley Fair Mall |
| QQ | American Express |
| RR | Utah Department of Transportation |

# ⍟ VALLEY FAIR MALL ⍟

## 2700 West East Side of Street

| | |
|---|---|
| 15 - Inbound | 37X - Outbound |
| 15 - Outbound | 38 - Outbound |
| 30 - Eastbound | 41 - Inbound |
| 31 - Eastbound | 42 - Inbound |
| 35 - Inbound | 50 - Inbound |
| 36 - Inbound | 50 - Outbound |
| 37 - Inbound | 53 - Outbound |
| 37X - Inbound | 89 - To U of U |

## Market Street West Side of Street

15 - Inbound
30 - Eastbound
31 - Eastbound
37 - Inbound
38 - East/West
50 - Inbound
53 - Inbound

## 2700 West West Side of Street

15 - Inbound
39 - Eastbound
41 - Outbound
42 - Outbound

## 3650 South North Side of Street

35 - Outbound
36 - Outbound
37 - Outbound
39 - Westbound

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West-East Corridor FEIS
Existing Bus Routes 2 of 2

Figure 3.9-5

Existing Bus Routes 2 of 2

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| TABLE 3.9-6<br>WEST-EAST CORRIDOR<br>SUMMARY OF EXISTING BUS ROUTES IN PROJECT AREA | | | | |
|---|---|---|---|---|
| Route | | Name | Weekday Frequency (In Minutes) | Saturday Frequency (In Minutes) |
| 1 | | 9th Avenue | 30 | 80 |
| 2 | | 6th Avenue | 30 | 80 |
| 3 | | 3rd Avenue | 24 | 31 |
| 4 | | Ft. Douglas | 20 | 60 |
| 5 | | Parley's Way | 30 | 60 |
| 7 | | Highland Park | 30 | 60 |
| 8 | | 11th East | 20 | 30 |
| 9 | | 9th East | 22 | 30 |
| 11 | | 13th East | 60 (20 during peak) | 60 |
| 12 | NS | Murray | 60 (30 during peak) | 60 |
| 13 | | Canyon Rim | 60 (30 during peak) | 60 |
| 14 | | East Millcreek | 60 (30 during peak) | 60 |
| 16 | | South 9th West | 40 | 60 |
| 17 | | Poplar Grove | 40 | 60 |
| 18 | | No. Redwood Road | 30 | 60 |
| 19 | | Fairgrounds | 30 | 80 |
| 20 | | North 6th West | 30 | 80 |
| 23 | NS | State Capitol | 20 (10 during peak | 30 |
| 26 | | No. Temple 2200 W. | 14 trips per day | |
| 28 | | Sandy-Unisys | 2 trips per day | |
| 29 | | Wasatch Blvd | 60 | |
| 34 | | West Kearns | 30 | 60 |
| 37 | | Magna | 31 | 30 |
| 41 | NS | West Jordan | 60 (30 during peak) | 60 |
| 43 | | Bluffdale | 30 (20 during peak) | 45 |
| 48 | | West Jordan Express | 9 trips per day | |
| 50 | | Airport - Int'l Center | 30 | 60 |
| 51 | | Tooele/Grantsville Express | 8 trips per day | 2 trips per day |
| 52 | | University of Utah | 30 | 60 |
| 53 | | Tooele via Airport | 7 trips per day | 4 trips per day |
| 54 | | Olympus cove | 6 trips per day | |
| 55 | | SLC-Weber State Univ. | 22 trips per day | |
| 56 | | Airport-West Valley | 30 | 60 |
| 60 | | Woods Cross | 6 trips per day | |
| 61 | | Bountiful via State Cap. | 6 trips per day | |
| 62 | | North Salt Lake | 6 trips per day | |

NS denotes routes which run north/south. All other routes run west-east for at least a portion of their route near the downtown area

**Opportunities for Growth in Transit Ridership**

Mode-split analysis identifies the relative percentage of person trips using each transportation mode including auto, bus, bike, or walk. Recent surveys of mode split suggest that transit ridership to the airport is expected to increase significantly. Current numbers show that SLCIA generated approximately 76,000 trips per weekday in 1993, 742 of which arrive by public transit, resulting in transit ridership of 1.0 percent. By 2020, total trips will amount to 118,000 per weekday and 3,500 of those people will ride public transit, a ridership of about 3.0 percent based on WFRC estimates.

In downtown, however, greater potential exists for increasing transit ridership. Current data gathered by WFRC suggest that the downtown area (600 South to 600 North, I-15 to 200 East) generates approximately 380,000 person trips per day. Of these, 15,200 are transit trips producing transit ridership of approximately 4 percent. WFRC predictions indicate, however, that by 2020, transit ridership among trips generated by downtown will increase to 4.8. percent of total trips.

The University of Utah reports that sales of bus passes—which are heavily subsidized by the University and offered at a greatly reduced rate to students and faculty—have leveled off in recent years. Although UTA buses going to the University appear to be full, nearly 70 percent of faculty and students drive an automobile to reach the campus, while about 6.9 percent ride public transit. The remainder walk or travel by bicycle. Because the University of Utah is a commuter campus many of the students travel from home to school to work, back to classes, then home again. Many of the students jobs are located in downtown. Therefore, the proposed LRT system would be well suited to serve this travel pattern, as students commuting by LRT would not be required to park a vehicle downtown or at the University.

## 3.9.3 Existing Bicycle Facilities

A map of existing bicycle routes in Salt Lake City is shown in Figure 3.9-6. These routes are used by local area residents for commuting and recreational use. This section only considers Salt Lake City designated bicycle routes. Salt Lake City currently separates bicycle routes into three classes.

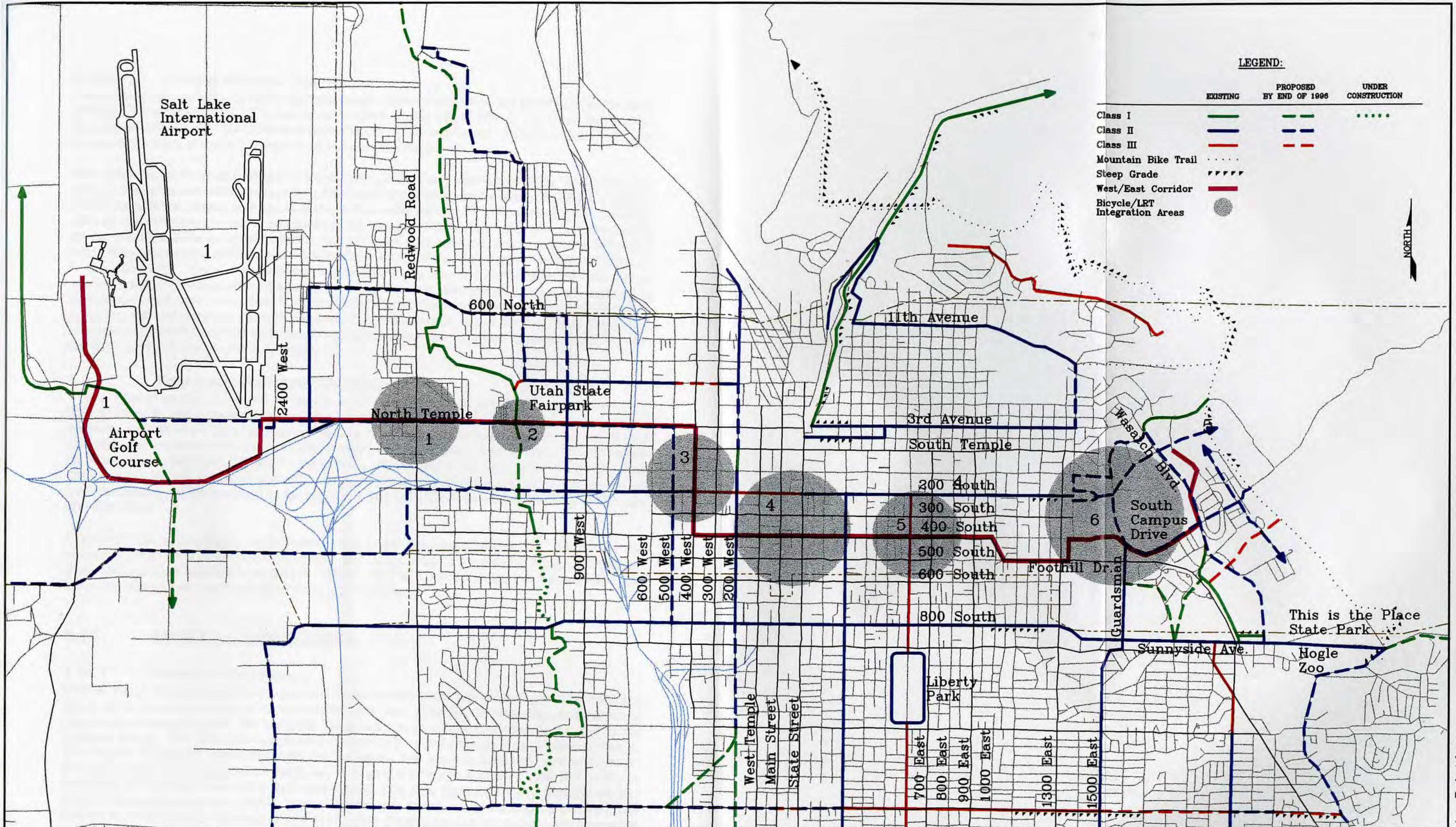
**Class 1** - Bicycle paths are independent right-of-ways completely separated from any street or highway. They may be paved or unpaved, could have steep grades and often share right-of-way with pedestrians;

**Class 2** - Bicycle lanes are striped and signed on-street lane for unidirectional bicycle travel;

**Class 3** - Bicycle routes have on-street signing designating bicycle travel in lanes shared with motorized vehicles.

The North Temple portion of the West-East Corridor is part of a major west-east designated Class 2 bicycle route linking the airport area with the University of Utah campus. The route runs east along North Temple to 500 West, south on 500 West to 200 South, and east on 200 South to the campus. Class 2 routes also share the corridor along South Campus Drive and Wasatch Blvd.

Class 2 routes cross the corridor at 2200 West, 1000 West, 200 West, and 300 East. The Jordan River Parkway, a Class 1 route, crosses the corridor west of the State Fairpark. A Class 3 route crosses the corridor at 700 East.

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West-East Corridor FEIS
Existing Bicycle Routes - Project Area

Figure 3.9-6

Existing Bicycle Routes - Project Area

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### 3.9.4 Freight Railroad Operations

Railroads dominated intercity passenger and freight transportation from the late 1800s to the early 1920s. Transportation by rail began to grow again during World War II, but since then it has steadily declined due to the increased use of automobiles and trucks. Railroads, however, still transport the highest share of freight on a ton-per-mile basis.

The Union Pacific Railroad (UP) and the Salt Lake Garfield and Western Railway (SLG&W) both operate freight service within the corridor. The SLG&W provides service between UP and shippers at the International Center, and operates one or two trains per day. The number of trains operated daily by UP within the corridor is estimated at 62, however this number changes daily depending on the operational needs of the railroad. The UP west-east mainline runs through the Salt Lake urban area, intersecting with north-south operations at Ogden and sharing the north-south mainline to Salt Lake City. There, the west-east mainline diverges from the north-south line and heads westward again. Because of the mainline traffic from the east, and possibly due to an increase in west-east freight traffic stemming from the Union Pacific/Southern Pacific merger of 1995, the switching and maintenance yards in Salt Lake City are active 24 hours per day. Due to the lack of grade-separated crossings between the eastern and western portions of the corridor, conflict between auto and train traffic is common.

### 3.9.5 Passenger Railroad Operations

The number of people who travel by train is much lower than the number of those who travel by other modes. In 1986, passengers who traveled by rail comprised less than one percent. Amtrak presently operates the only passenger rail service in the region. Currently there is one eastbound and one westbound Amtrak train per day through Salt Lake City. Amtrak uses the UP freight corridor between Salt Lake City and Provo, and the UP mainline to the west of Salt Lake City. The Salt Lake City station is located at the Denver and Rio Grande Depot at 450 West 300 South. In 1999, the station will be relocated to the proposed Salt Lake City Intermodal Center at 200 South and 600 West.

Passenger rail patronage would increase if commuter rail was implemented. Commuter rail crossings would be at-grade with city streets, as it would likely share existing freight rail right-or-way. The proposed commuter rail station in Salt Lake City would be located at the proposed Salt Lake City Intermodal Center, as will the new Amtrak depot.

## 3.10 MINERAL RESOURCES

### 3.10.1 General Description

Mineral resources present within or near the corridor include good quality sand, gravel and building stone, which have been mined at various times in the past. Potential common clay resources and natural gas are also present. The Salt Lake Valley is a structural basin bounded on the east by the Wasatch Range. The Wasatch Fault Zone is present at the western base of the Wasatch Range. The Oquirrh Mountains bound the valley on the west. The basin is filled with lake and stream deposits and alluvium. A portion of the Great Salt Lake, a remnant of ancient Lake Bonneville, is present in the northern part of the Salt Lake Valley. The rock types in the Wasatch Range and Oquirrh Mountains near the corridor consist primarily of limestone, shale and sandstone. The eastern end of the corridor terminates at the University of Utah, located on ancient Lake Bonneville shorelines at the western edge of the Wasatch Range front. West of the project is the Great Salt Lake and ancient Lake Bonneville lake plain.

Salt Lake Valley topography has been shaped by ancient Lake Bonneville, by stream activity and by alluvium eroded from the adjacent mountains. At the maximum high water, Lake Bonneville attained a depth of more than 1,000 feet in the area of the present Great Salt Lake (Hintze, 1973). Shorelines of the lake are a conspicuous feature along the mountain range and valley margins in the Salt Lake Valley and prominent in the University of Utah area. Below the shorelines, flat-lying former Lake Bonneville sediments form a gently undulating plain in the center of the Salt Lake Valley. The structural basin is filled extensively with unconsolidated clay, silt, sand and gravel alluvium that locally attains vertical depths in excess of 2,000 feet (Hely et al., 1971). Sand and gravel is mined, primarily along the margins of the valley. Evaporation ponds, used for mineral extraction from Great Salt Lake water, are located west of the corridor.

The Jordan River flows northward in the center of the valley from Utah Lake to the Great Salt Lake and has deposited fine-grained floodplain (overbank) deposits (see Figure 3.8-1). From the confluence of Big Cottonwood Creek in Salt Lake City to the Great Salt Lake, the Jordan River forms a huge fan-shaped floodplain and delta complex (Davis, 1983). West of State Street in Salt Lake City, the corridor is primarily located on the recent (Quaternary) Jordan River floodplain and delta complex.

Local areas within the corridor have perched water table zones. In some low-lying areas near the center of the valley, the alluvium is saturated by shallow groundwater at or near the ground surface. At the surface, the nearly flat lake and floodplain topography was conducive to the formation of swamps and marshes in the area. In the swampy and marshy areas, dark, highly organic, sediments accumulated. The saturated alluvium and highly organic sediments generally are a poor sub-base for man-made structures.

### 3.10.2 Sand, Gravel and Quarry Aggregates

Sand and gravel deposits are extensive, primarily along the Lake Bonneville shorelines and are present at the eastern edge of the corridor. Permitted rock aggregate (sand and gravel) mines, reported by the Utah Department of Natural Resources, Division of Oil, Gas and Mining (September 1996), are located near the West-East Corridor. These rock aggregate mines are located in Township one North, Range one West, Sections 14, 24 and 25. (The terms "township", "range", and "section" are commonly used by the United States Geological Survey, and the Utah State Offices, Division of Oil, Gas and Mining to identify specific locations of mineral resources.)

The Utah Department of Natural Resources, Utah Geological Survey (September 1996) reports the following resources are present in the area of the corridor:

**Township One North, Range One East, Sections 31-34**
All sections contain good quality Lake Bonneville sand and gravel, most of which is inaccessible due to urbanization. Section 33 contains a small limestone prospect (in Limekiln Gulch), the remnant of an early attempt at lime production.

**Township One South, Range One East, Sections 2-4, 10-11**
All sections contain good quality Lake Bonneville sand and gravel, most of which is inaccessible due to urbanization. Section three contains a building-stone quarry and resource. Sandstone was quarried for early construction projects at Fort Douglas and possibly for use in building foundations in Salt Lake City houses. Section 11 contains a small limestone deposit.

**Township One North, Range One West, Sections 19-36**
Sections 23-26 and 36 contain good quality Lake Bonneville sand and gravel although most of it is inaccessible due to urbanization.

### 3.10.3 Other Resources

**Township One North, Range One West, Sections 19-22 and 27-35**
Section 19-22 and 27-35 may contain common clay resources. Sections 21 and 30 produced small amounts of natural gas in the past.

**Township One North, Range Two West, Sections 1-6, 19-36**
All of these sections have potential for common clay deposits. Sections five and six contain solar salt ponds (evaporation ponds). Sections 27 and 29 produced small quantities of natural gas in the past.

## 3.11 NOISE AND VIBRATION

This section defines the noise and vibration descriptors that will be used throughout the impact assessment, and describes the existing noise and vibration environments in the vicinity of the proposed project. Appendix D contains noise data sheets for this analysis.

### 3.11.1 Community Noise Characteristics

The areas near the proposed rail stations and rail corridor routinely experience noise to varying degrees from sources such as traffic, trains, industry, and aircraft over-flights. The combination of noise from all of these sources is referred to as community noise, and is most commonly measured in A-weighted decibels (dBA)[1]. Community noise levels typically range from about 40 to 60 dBA. Levels as low as 30 dBA are possible during nighttime hours in an area void of traffic and industry, and levels as loud as 90 dBA could result during a close truck pass-by or low aircraft over-flight. Figure 3.11-1 shows typical noise levels.

Single-number descriptors have been developed to facilitate analysis of the continuously fluctuating community noise environment. Two descriptors commonly used in planning documents are the $L_{eq}$ and $L_{dn}$. The $L_{eq}$ is a level with the same energy content as the fluctuating noise level over a given time period. The $L_{dn}$ is a 24-hour average calculated from hourly $L_{eq}$ values, with 10 dB added to nighttime levels to account for heightened noise-sensitivity at night.

### 3.11.2 Existing Sources of Noise

Community noise along the proposed West-East Corridor is determined primarily by aircraft, railroad freight trains, freeway traffic and local street traffic, depending on the particular location. Arriving and departing aircraft from SLCIA are in continuous operation. Noise from airport operations currently impact the nearby community to the east of the airport. Rail lines south of the western portion of the West-East Corridor run nearly parallel to the proposed route. In the western portion of the downtown area, rail traffic also runs north and south. Noise from railroad operations is primarily from the locomotive engines and warning horns and can be heard at a great distance.

Heavy road traffic exists on North Temple along the west side of the corridor, 500 and 600 South in the business district and 400 South along the east side. Additional heavy road traffic exists on

[1]A decibel (dB) is a logarithmic unit used to quantify sound pressure levels. A-weighting of a sound pressure level refers to the application of sound frequency weightings that correspond to the variation in sensitivity of the human ear to different acoustic frequencies.

north-south routes of State Street, 200 East, 1300 East, 300 West, and West Temple. Various industrial sites and aircraft over-flights also contribute to the ambient noise level in several areas.

An identified high priority structure was the LDS Church 10th Ward Building located in the southwest corner of 400 South and 800 East. Accordingly, this site was monitored twice for traffic vibrations near the building. The following figure shows the results of the measured existing traffic vibration. Note that the vibration data at both the curb and the building foundation are will below building damage thresholds, but are near or above perception thresholds.

On August 13, 1998, additional site visits to noise and vibration sensitive locations were conducted along proposed LRT alignment, including the Field House on the University of Utah campus. The vibration measurements were conducted using a dual channel Larson-Davis Model 2900 real time spectrum analyzer, two B&K Type 2635 charge amplifiers, and two B&K Type 4370 accelerometers. Both channels of the vibration monitoring system were calibrated using a B&K Type 4294 vibration transducer calibrator. Calibration was performed according to the manufacturers' published instructions.

Both the curb vibration and vibration near the building foundations were monitored for fifteen minutes. Tables 3.11-1 and 3.11-2 show the measured existing average and maximum vibrations respectively, at several locations of note along 400 South. The previously measured LDS 10th Ward data has been included.

Exchange Place - A previously identified historic high rise structure district is the Exchange Place at the northeast quarter of Main Street and 400 South. Accordingly, this site was visited on Thursday, August 13, 1998, to monitor the existing peak AM and PM traffic noise and vibration near the building at the corner of Main and 400 South. Note that the maximum vibration data at both the curb and the building foundation are below the sensitive building damage threshold, but are well above the perception threshold.

New Courthouse - This building, which faces State Street, is set back from the south side of 400 South by about 100 feet. Existing measurements were conducted on Thursday, August 13, 1998, to monitor the existing peak AM traffic noise and vibration. Note that the vibration data at both the curb and about 60 feet south toward the building on the diagonal sidewalk are below building damage thresholds, but are near or above perception thresholds.

Field House - This building, adjacent to the Olympic stadium, is near the east terminus of 400 South on the University of Utah campus. Existing measurements were conducted on Thursday, August 13, 1998, to monitor the existing stadium construction noise and vibration. Note that the vibration data at both the retaining wall curb and the building foundation are below building damage thresholds, but are much greater at 25 and 31.5 hertz and are near or above perception thresholds.

Federal Courthouse - This building, which faces Main Street, is set back from the north side of 400 South by about 40 feet. Existing measurements were conducted on Thursday, August 13, 1998, to monitor the existing peak PM traffic noise and vibration. Note that the vibration data at both the curb and the building foundation are below building damage thresholds, but are near or above perception thresholds.

## TABLE 3.11-1
## MEASURED AVERAGE VIBRATION DATA

| 1/3 Octave Band Center Frequency Hz | U of U House Vibration at Curb VdB* | U of U House Vibration at Bldg. VdB* | LDS 10th Ward Avg Vibration at Curb, VdB* | LDS 10th Ward Avg Vibration at Bldg., VdB* | Exchange Place Avg Vibration at Curb, VdB* | Exchange Place Avg Vibration at Bldg., VdB* | Exchange Place Avg Vibration at Curb, VdB* | Exchange Place Avg Vibration at Bldg., VdB* | New Court House Vibration at Curb, VdB* | New Court House Vibration at Bldg., VdB* | Fed. House Vibration at Curb, VdB* | Fed. Court House Vibration at Bldg., VdB* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Overall Level* | *66.3* | *65.3* | *71.2* | *73.5* | *57.1* | *59.8* | *65.3* | *65.3* | *60.0* | *52.7* | *65.3* | *58.5* |
| 4 | 44.7 | 46.3 | 55.5 | 68.4 | 46.9 | 46.7 | 54.7 | 57.8 | 48.1 | 38.0 | 48.4 | 48.4 |
| 5 | 43.2 | 43.5 | 54.1 | 67.9 | 46.5 | 41.6 | 45.0 | 55.5 | 48.8 | 45.0 | 35.8 | 43.9 |
| 6.3 | 42.2 | 57.7 | 53.7 | 62.7 | 45.1 | 37.8 | 56.0 | 55.2 | 45.8 | 42.8 | 46.0 | 41.5 |
| 8 | 41.8 | 59.7 | 53.6 | 58.2 | 44.0 | 46.5 | 51.0 | 53.2 | 46.1 | 43.4 | 54.8 | 41.7 |
| 10 | 41.1 | 26.4 | 53.6 | 56.1 | 51.5 | 48.5 | 56.4 | 53.3 | 52.3 | 46.2 | 60.6 | 44.3 |
| 12.5 | 43.2 | 35.1 | 58.3 | 59.2 | 50.4 | 49.4 | 55.0 | 54.1 | 54.3 | 44.3 | 60.2 | 41.8 |
| 16 | 41.8 | 34.6 | 62.2 | 58.6 | 48.3 | 49.6 | 54.5 | 54.7 | 53.3 | 42.1 | 57.1 | 36.6 |
| 20 | 44.6 | 43.0 | 65.9 | 65.9 | 42.5 | 45.8 | 55.3 | 52.3 | 49.3 | 36.3 | 51.7 | 52.8 |
| 25 | 65.5 | 60.9 | 64.2 | 57.7 | 33.4 | 53.9 | 55.0 | 55.6 | 42.7 | 37.4 | 45.1 | 48.9 |
| 31.5 | 57.9 | 57.3 | 62.5 | 56.0 | 37.9 | 54.3 | 56.1 | 54.1 | 42.5 | 37.3 | 47.4 | 54.2 |
| 40 | 40.7 | 35.3 | 61.2 | 53.5 | 42.0 | 44.8 | 56.8 | 55.4 | 40.5 | 37.9 | 41.9 | 30.5 |

* NOTE: VdB refers to unweighted vibrational velocity decibel referenced to 1 microinch/second.

**TABLE 3.11-2**
**MEASURED MAXIMUM VIBRATION DATA**

| 1/3 Octave Band Center Frequency | U of U House Max Vibration at Curb | U of U House Max Vibration at Bldg. | LDS 10th Ward Max Vibration at Curb, | LDS 10th Ward Max Vibration at Bldg., | Exchange Place Max Vibration at Curb, | Exchange Place Max Vibration at Bldg., | Exchange Place Max Vibration at Curb, | Exchange Place Max Vibration at Bldg., | New Court House Max Vibration at Curb, | New Court House Max Vibration at Bldg., | Fed. Court House Max Vibration at Curb, | Fed. Court House Max Vibration at Bldg., |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hz | VdB* | VdB* | VdB* | VdB* | VdB* | VdB* | VdB* | VdB* | VdB* | VdB* | VdB* | VdB* |
| *Overall Level* | *80.5* | *77.7* | *70.7* | *73.3* | *80.3* | *79.3* | *92.1* | *90.5* | *79.4* | *71.7* | *86.3* | *72.0* |
| 4 | 52.4 | 55.8 | 48.0 | 68.3 | 54.7 | 62.7 | 78.6 | 76.3 | 62.9 | 62.1 | 67.6 | 64.6 |
| 5 | 50.7 | 53.9 | 50.7 | 67.8 | 56.4 | 61.5 | 69.6 | 74.0 | 74.6 | 67.3 | 66.2 | 60.2 |
| 6.3 | 52.3 | 57.7 | 45.4 | 62.3 | 52.6 | 59.4 | 80.7 | 77.8 | 70.0 | 64.1 | 70.9 | 56.1 |
| 8 | 54.5 | 59.7 | 53.6 | 56.5 | 66.0 | 65.6 | 76.1 | 75.0 | 61.0 | 59.5 | 74.1 | 58.4 |
| 10 | 54.3 | 44.5 | 53.6 | 52.7 | 72.2 | 65.8 | 77.7 | 74.7 | 69.1 | 63.3 | 81.2 | 67.2 |
| 12.5 | 53.6 | 43.1 | 55.8 | 58.2 | 75.7 | 74.2 | 77.0 | 75.7 | 70.9 | 56.9 | 82.4 | 64.9 |
| 16 | 57.8 | 56.1 | 61.5 | 56.3 | 76.3 | 74.1 | 79.1 | 79.7 | 70.9 | 53.9 | 76.4 | 47.2 |
| 20 | 53.2 | 62.7 | 65.6 | 65.7 | 65.0 | 66.7 | 81.3 | 75.8 | 69.5 | 48.7 | 72.9 | 52.8 |
| 25 | 78.4 | 74.3 | 63.8 | 55.2 | 62.2 | 61.9 | 81.2 | 82.6 | 63.4 | 52.5 | 64.5 | 48.9 |
| 31.5 | 76.1 | 73.9 | 61.6 | 47.1 | 50.6 | 70.1 | 82.7 | 77.8 | 55.4 | 52.9 | 61.5 | 54.2 |
| 40 | 54.6 | 55.5 | 60.6 | 53.5 | 49.8 | 62.3 | 83.6 | 81.2 | 56.3 | 49.5 | 60.4 | 51.3 |

* NOTE: VdB refers to unweighted vibrational velocity decibel referenced to 1 microinch/second.

### 3.11.3 Noise-Sensitive Receptors

Of the various land uses that surround the project, residential areas are the most noise-sensitive.

The following are brief descriptions of land uses along the project alignment:

- On both sides of North Temple, there are some scattered apartment buildings, mobile homes and motels; a few single family residences are also located along the route. Most single family residences are located on cross streets perpendicular to North Temple. An existing railroad runs parallel to North Temple approximately 800 feet to the south;
- Along 400 West, there are mostly commercial and industrial land uses. Pioneer Park is located on the northeast quadrant of 400 West and 400 South. Located on the southwest quadrant of 400 West and North Temple is the Union Pacific Railroad Station;
- On 400 South, most of the land uses are commercial. There are some residential land uses located toward the eastern end of 400 South near the transition to 500 South. Many hotels are situated along this street within the project area. Also, surrounding the City and County Building is Washington Square, located on 400 South between State Street and 200 East;
- On 500 South, most land uses are single family residential with some multi-family residential and a large apartment complex located at 1300 East.

### 3.11.4 Ambient Noise Level Measurements

A site visit was conducted in February 1997, to identify representative sensitive receptor locations and conduct noise measurements to evaluate existing background noise levels in the vicinity of the project area. Additional site visits were conducted in June and August, 1998 to identify and monitor additional sensitive noise receptors in the downtown area and the eastern part of the West-East Corridor.

Four sets of Larson-Davis Model 870 Precision Integrating Sound Level Meters (LD870) and two Larson-Davis Model CA250 Acoustic Calibrator (CA250) were used to conduct noise measurements. The LD870's are ANSI Type 0 instruments. All instruments were calibrated and operated according to the manufacturer's specifications. In addition, all noise measuring equipment is inspected and calibrated annually by the instrument manufacturer.

The entire corridor was toured prior to these measurements to determine the location of all noise-sensitive receptors. The measurement locations represent receptors both adjacent to and within one block from the corridor.

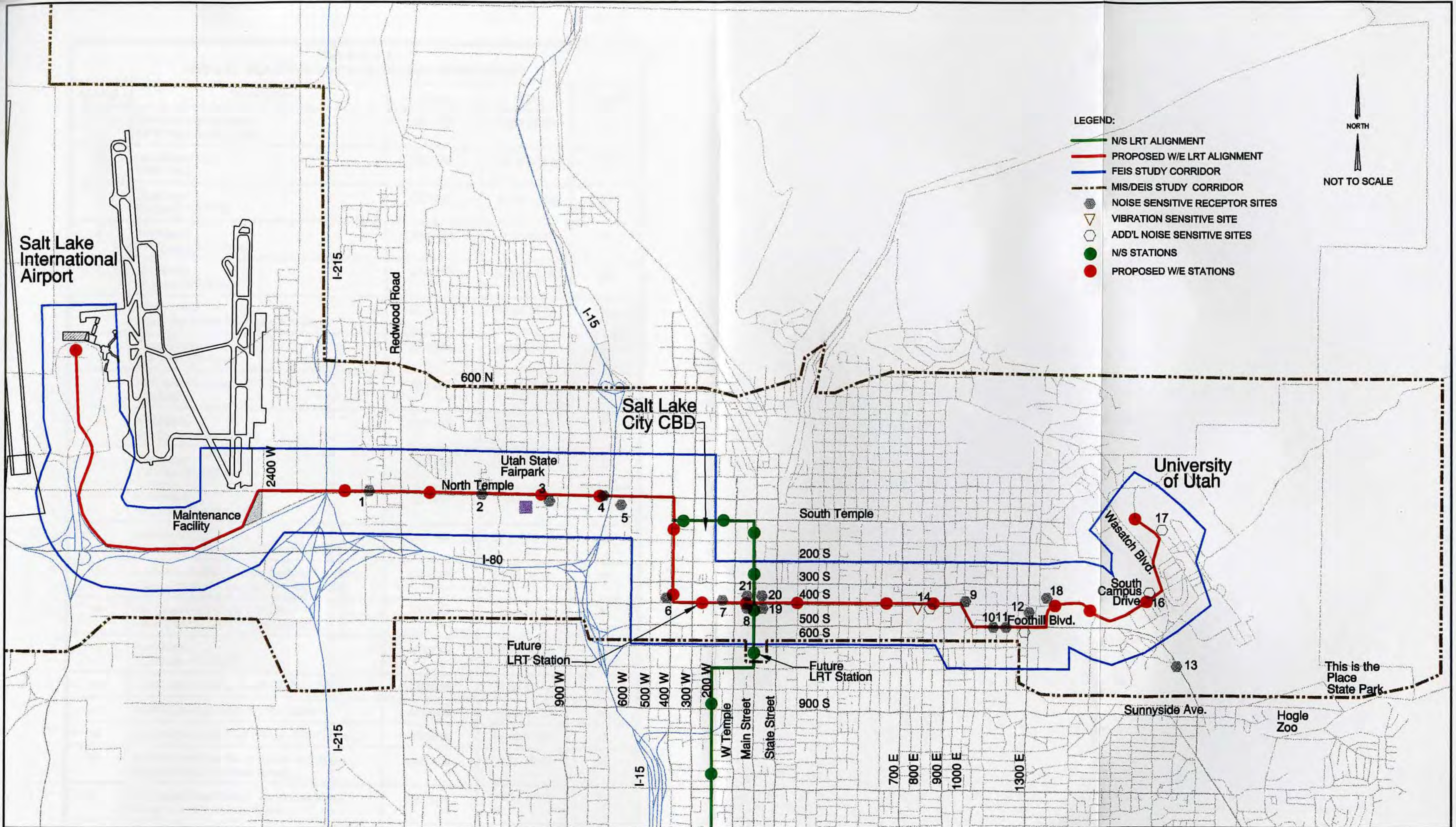
Noise measurements were conducted at 13 locations along the project alignment. Continuous 24-hour noise monitoring was conducted at 1 site, and short-term monitoring was conducted at each of the remaining 12 sites. The results of the 24-hour noise measurements were used to establish the worst-case traffic noise impact hours. All short-term noise measurements were conducted during peak hours or as close to peak hours as possible. All measurements were conducted at residential locations, except for two sets of short-term measurements, which were conducted at a park. Figure 3.11-2 shows the location of all ambient noise level measurements taken during the survey. This figure shows the additional noise measurement locations taken during the 1998 site visits. Table 3.11-3 presents a list of all the measurement locations and the highest measured hourly background noise levels. Detailed measured noise data are presented in Appendix E.

The measured values of peak-hour $L_{eq}$ in the project area varied between 58 and 71 dBA. These levels are typical for the subject areas adjacent to a major traffic route. Figure 3.11.1 is included in this report for reference purposes and may be used to compare the measured sound levels to typical sound levels encountered in selected indoor and outdoor environments.

## FIGURE 3.11-1
## TYPICAL SOUND LEVELS FROM INDOOR AND OUTDOOR NOISE SOURCES

| INDIVIDUAL OR COMMUNITY RESPONSE TO CONTINOUS NOISE | SOUND LEVEL, dBA | NOISE SOURCE |
|---|---|---|
| Threshold of Physical Discomfort | 120 | Commercial Jet Takeoff (Near Runway) |
| | 110 | Riveting Machine |
| | 100 | Piledriver (50') |
| | | Ambulance Siren (100') |
| Hearing Damage Criteria for 8-Hour Workday | 90 | Diesel Bus (At Sidewalk) |
| | | Inside Boiler Room or Printing Press Plant |
| Most Residents Highly Annoyed | 80 | Gas Lawn Mower (100') |
| | | Inside Sports Car, 50 mph |
| | 70 | Freight Train (100') |
| Acceptability Limit for Residential Development | | Car Passby (50') |
| | 60 | Average Urban Area |
| Goal for Urban Area | | Inside Department Store |
| | 50 | Inside Business Office |
| | | Light Traffic (100') |
| | 40 | Inside Home |
| No Community Annoyance | 30 | Quiet Rural Area |
| | 20 | |
| | | Inside Recording Studio |
| | 10 | |
| Threshold of Hearing | 0 | |

Source: Parsons Engineering Science, Inc.




UTA TRAX TRANSIT EXPRESS

WASATCH FRONT REGIONAL COUNCIL
420 West 1500 South, Suite 200
Bountiful, Utah 84010

PARSONS TRANSPORTATION GROUP
DE LEUW, CATHER & COMPANY

# West-East Corridor FEIS Noise Measurement Sites

Figure 3.11-2

| Table 3.11-3<br>HIGHEST MEASURED AVERAGE HOURLY NOISE LEVELS | | | | |
|---|---|---|---|---|
| Site No. | Description | Date | Time | $L_{eq}$ dBA |
| 1 | Sky Harbor Apartments<br>1876 West North Temple | 02/11/97 | 06:52-07:08 | 67 |
| 2 | Mobile homes<br>1300 West | 02/11/97 | 07:18-07:45 | 67 |
| 3 | Residence<br>60 South 10th West | 02/11/97 | 07:20-07:40 | 65 |
| 4 | Residence<br>776 West North Temple | 02/11/97 | 07:55-08:18 | 69 |
| 5 | Residence<br>67 South 600 West | 02/11/97 | 07:58-08:15 | 66 |
| 6 | Pioneer Park<br>NE corner of 400 South and 400 West | 02/11/97 | 08:34-08:51 | 63 |
| 7 | Courtyard-Marriott<br>130 West 400 South | 02/12/97 | 08:59-09:15 | 67 |
| 8 | Park in front of City Hall<br>400 South | 02/10/97 | 16:15-16:35 | 63 |
| 9 | Residence<br>938 East 400 South | 02/11/97 | 07:34-07:49 | 71 |
| 10 | Residence<br>121 East 500 South | 02/11/97 | 07:30-07:55 | 70 |
| 11 | Residence<br>480 South Douglas Street | 02/11/97 | 12:00-13:00 | 71 |
| 12 | Residence<br>University St. between 400 and 500 South | 02/11/97 | 07:59-08:14 | 60 |
| 13 | University of Utah Student Apartments - West Village Building C (Not on LRT Alignment) | 02/11/97 | 08:30-08:45 | 58 |
| 14 | SW Corner 400 South 800 East<br>North Side of LDS 10th Ward Building | 07/08/98 | 16:45-15:00 | 72 |
| 15 | Residence<br>1272 East 400 South | 07/08/98 | 17:15-15:30 | 69 |
| 16 | Huntsman Center on South Campus Drive | 07/08/98 | 12:00-12:15 | 63 |
| 17 | Medical Drive at Medical Drive South | 07/08/98 | 11:20-11:30 | 64 |
| 18 | University of Utah Field House - SW Corner | 08/13/98 | 10:45-11:00 | 81 |
| 19 | New Courthouse - South side of 400 South between Main and State Streets | 08/13/98 | 08:15-08:30 | 69 |
| 20 | Exchange Place District - North side of 400 South, just east of Main Street | 08/13/98 | 17:00-17:15 | 73 |
| 21 | Federal Courthouse - North side of 400 South, just west of Main Street | 08/13/98 | 16:15-16:30 | 73 |

a - 24-hour measurements taken at this location
Source: Parsons Engineering Science, Inc.

### 3.11.5 Vibration

Vibration is technically termed an oscillatory movement and can be expressed in decibels (dB)[2] Figure 3.11-3 shows typical vibration levels at 50 feet from some common sources, and lists human response to various levels. Typical background vibration levels in a residential area are 50 dB or lower, which is below the human perception limit of about 65 dB.

The major source of vibration in the West-East Corridor is the existing freight rail trains, particularly the locomotives. Vibration from light rail vehicles is expected to be substantially less than freight train and locomotive vibration. Vibration from bus and automobile traffic is expected to be generally imperceptible.

### 3.11.6 Ambient Vibration Level Measurement

A site visit along the proposed alignment was conducted in May 1998, to identify vibration sensitive receptor locations and conduct measurements to determine existing traffic vibration levels in the vicinity of a vibration-sensitive receptor. The proximity of each potential vibration-sensitive building to the proposed LRT alignment was specifically noted. Several of the buildings were identified as candidates for detailed physical inspection, documentation of existing cracks and monitoring of existing vibrations during high traffic periods. Due to the foundation type and proximity to the alignment, the LDS Church 10th Ward Building, located on the southwest corner of 400 South and 800 East, was selected for vibration monitoring.

The vibration measurements were conducted using a dual channel Larson-Davis Model 2900 real time spectrum analyzer, two B&K Type 2635 charge amplifiers, and two B&K Type 4370 accelerometers. Both channels of the vibration monitoring system were calibrated using a B&K Type 4294 vibration transducer calibrator. Calibration was performed following the manufacturers published instructions.

Table 3.11-4 shows the measured "root mean square" (rms) vibration data and the various spectral and overall vibration criteria.

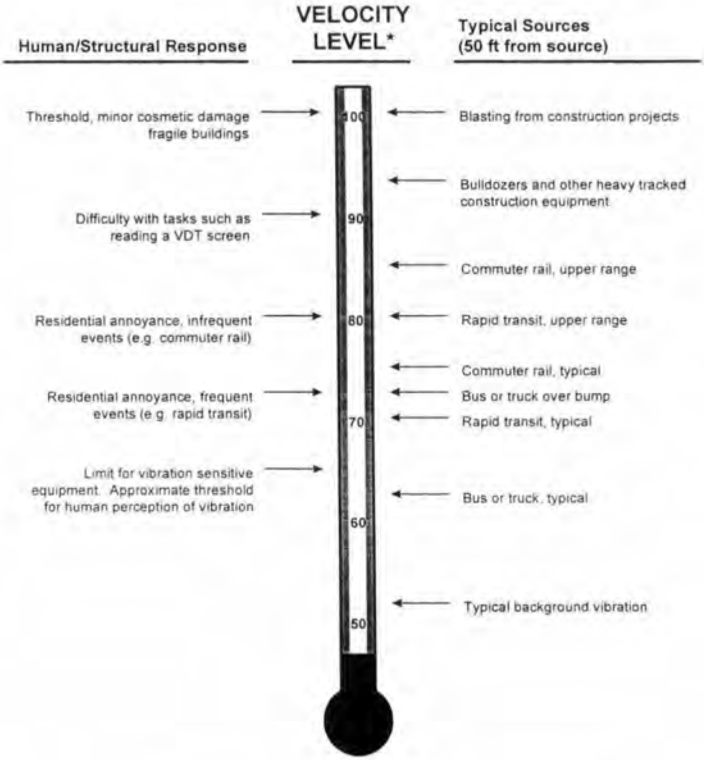
Architectural-type cosmetic or surface damage, such as slight cracks, may occur when a structure is exposed to sustained or long-term repeated vibrations greater than the threshold. Minor structural damage may occur when the vibration is at a level 6 to 10 VdB above the respective building-type thresholds. Thus, any minor historic building structural damage due to vibrations would not be expected to occur until sustained or long-term repeating vibration velocity levels exceeded a range of from 109 to 113 VdB, depending on the structure.

[2]Vibration levels are in decibels (dB) for vibrational velocity, relative to 1 microinch per second.

| TABLE 3.11-4<br>RMS VIBRATION CRITERIA AND MEASURED DATA | | | | | | |
|---|---|---|---|---|---|---|
| 1/3 Octave Band Center Frequency | Normal Building Damage Threshold | Sensitive Building Damage Threshold | Historic Building Damage Threshold | Human Perception Threshold | Maximum Traffic Vibration at Curb | Maximum Traffic Vibration at Bldg. Ground |
| Hz | VdB* | VdB* | VdB* | VdB* | VdB* | VdB* |
| *Overall Level* | *109.0* | *103.0* | *95.0* | *65.0* | *75.1* | *97.5* |
| **4** | 101.6 | 95.6 | 87.6 | 57.6 | **58.5** | **95.3** |
| **5** | 100.5 | 94.5 | 86.5 | 56.5 | **55.7** | **91.2** |
| **6.3** | 99.2 | 93.2 | 85.2 | 55.2 | **54.3** | **87.3** |
| **8** | 98.1 | 92.1 | 84.1 | 54.1 | **54.9** | **83.1** |
| **10** | 97.5 | 91.5 | 83.5 | 53.5 | **62.7** | **79.0** |
| **12.5** | 97.2 | 91.2 | 83.2 | 53.2 | **59.7** | **74.9** |
| **16** | 96.9 | 90.9 | 82.9 | 52.9 | **60.2** | **70.8** |
| **20** | 96.7 | 90.7 | 82.7 | 52.7 | **65.3** | **65.0** |
| **25** | 96.6 | 90.6 | 82.6 | 52.6 | **66.6** | **59.9** |
| **31.5** | 96.5 | 90.5 | 82.5 | 52.5 | **70.4** | **59.5** |
| **40** | 96.3 | 90.3 | 82.3 | 52.3 | **65.2** | **53.5** |

* NOTE: VdB refers to unweighted vibrational velocity decibel referenced to 1 microinch/second.

**FIGURE 3.11-3**
**TYPICAL VIBRATION LEVELS**




** RMS Vibration Velocity Level in dB relative to $10^{-6}$ inches/second*

Source: *Transit Noise and Vibration Assessment*,
U.S. DOT Federal Transit Administration, April 1995

## 3.12 UTILITIES

The West-East Corridor contains a number of utilities which cross it, or run longitudinally within it. Some of these utility lines will have to be relocated during construction. A utility audit conducted during Preliminary Engineering identified the following utility owners within the corridor:

**Salt Lake City**
- Storm Drain
- Sanitary Sewer
- Potable Water

**Communications**
- US West
- Questar Infocomm
- TCI Cable
- Brooks Fiber Communications
- MCI
- Electric Lightwave

**Power**
- Utah Power and Light

**Gas**
- Questar Gas

The great majority of these utilities run roughly along curblines in the corridor. Typically, the density of utilities decreases from the curbline to the centerline of the streets. Longitudinal conflicts will be drastically reduced if the tracks are constructed center-running in the streets. All references to longitudinal conflicts in the summary below assumes center-running construction. Between 400 West and 200 East, the LRT alignment on 400 South will run single tracks along each side of the street. This track configuration may mean that utility relocation will be greater in this part of the LRT corridor. A summary of each utility audit follows.

### 3.12.1 Salt Lake City Storm Drain

The corridor is crossed by more storm water lines than by any other utility. Sizes range from 12-inch to 84-inch in diameter. There are at least 73 crossings, most of which are 12 to 36 inches in diameter. There are potential longitudinal conflicts on 400 South with an 18-inch line between 400 West and 300 West, on 1300 East with a 60-inch line between 500 South and 400 South, and on South Campus Drive with a 36-inch line between University Street and Rice-Eccles Stadium. Major corridor crossings include: North Temple at about 2300 West (60-inch), North Temple at the Jordan River and at 600 West (84-inch), North Temple at 400 West (42-inch), 400 South at 200 West (42-inch), 850 East 400 South (36-inch Brick), South Campus Drive (60-inch, and 36-inch 3 times).

### 3.12.2 Salt Lake City Sanitary Sewer

At least 31 sanitary sewer crossings were identified in the corridor. Sizes range from 12-inch to 66-inch diameter pipe. About two thirds of these crossings are 8-inch diameter lines. Typically these lines are at sufficient depth to not require relocation. Potholing during preliminary engineering will verify this. Major crossings include: Winifred Street and North Temple (48-inch); 1000 West North Temple (66-inch); 100 South 400 West (48-inch); and 200 West 400 South (48-inch). Longitudinal conflicts with the anticipated alignment are possible on 400 South with 8-inch lines between 300 West and 200 East on the north side, between 300 West and 200 West on the south side, and between West Temple and Main Street on the south side.

### 3.12.3 Salt Lake City Potable Water

At least 60 water line crossings were identified in the corridor. Pipe sizes range from 4-inch to 36-inch. 51 of the 60 crossings are 12-inch or less. Major crossings include: North Temple at about 2500 West and 2200 West (36-inch); 400 South at 300 West (16-inch); 400 South at Main Street (16-inch); 400 South at 200 East (20-inch); 1300 East 400 South (24-inch); and South Campus Drive (22-, 24-, and 35-inch). There are potential longitudinal conflicts with a 6-inch line under the North Temple viaduct, with a 10-inch line on 400 West between North Temple and 200 South, with a 6-inch line on 400 South between 400 West and 300 West, with a 12-inch line on 400 South between 400 West and 300 West, and with a 30" cast iron pipe on 400 South at undefined locations.

### 3.12.4 University of Utah Storm Drain

The University owns storm sewer lines on campus. All storm drain lines connect to the Salt Lake City storm drain system. The proposed LRT corridor is crossed 17 times by storm sewer lines on campus.

### 3.12.5 University of Utah Sanitary Sewer

The University owns sanitary sewer lines on campus. They do not treat their own sanitary waste. All lines connect to Salt Lake City lines to be treated. A new 15-inch line was planned for the north side of east South Campus Drive which is also the proposed location for the LRT tracks. The University has shifted the sewer line to the south side of South Campus Drive to be consistent with the LRT plan. The proposed LRT alignment is crossed 11 times by sanitary sewer lines on campus.

### 3.12.6 University of Utah Potable Water

The proposed LRT alignment is crossed 10 times by water lines on campus.

### 3.12.7 University of Utah Heated Water

The University has a heated water system that crosses the proposed LRT alignment in one location at South Medical Drive. The water is at 400° F at this location and under a pressure of 390 psi. There are 4 separate lines at that location which are about 6 to 8 feet deep and are not encased. The carbon steel (schedule 40) lines are approximately 25 years old and have become corroded on the outside. The lines frequently rupture with varying degrees of severity. The University has a long term plan to replace the lines, but replacement will not be accomplished all at once.

### 3.12.8 US West

US West has not provided complete information regarding the location of their facilities. The portion of the alignment that runs alongside I-80 (between North Temple and the airport) was verbally described as a potential longitudinal conflict with a fiber optic line. US West has also indicated that they believe that the 400 West portion of the alignment is conflict-free. US West has indicated that they will provide more detailed information during final design.

### 3.12.9 Questar Infocomm (QI)

QI fiber optic lines run along 400 West (curbside), 400 South (curbside), and along Wasatch Drive (curbside). Location maps supplied by QI indicated that the fiber lines are typically buried at least 36 inches with some lines at only 26 inches to be on top of US West lines in the same trench.

### 3.12.10 TCI Cable

There at least 27 cable television crossings in the corridor, 25 of which are overhead. These overhead crossings may conflict with the LRT catenary. Two underground crossings are located at 600 West North Temple and at the UP Depot on 400 West.

### 3.12.11 Brooks Fiber Communications (BFC)

BFC fiber lines are located in discontinuous portions of the corridor. Mapping of their exact location was not available, however, lines are generally located at or near the sidewalk. Airport: No BFC lines were identified. North Temple: BFC lines running longitudinally in North Temple are between 2400 West and 2200 West, and between 1200 West and 900 West. BFC lines crossing the corridor on North Temple are located at 2400 West and 1000 West. 400 West: BFC lines running longitudinally in 400 West are between 200 South and 300 South. BFC lines crossing the corridor on 400 West are located at 200 South and 300 South. 400/500 South: BFC lines running longitudinally in 400 South are between 300 West and 400 East, and between 1100 East and 1500 East. BFC lines crossing the corridor in 400 South are located at West Temple, 200 East, and 300 East. University of Utah Campus: BFC lines run longitudinally within the corridor on Wasatch Blvd. and on Medical Drive.

### 3.12.12 MCI

MCI maps show no conflicts within the corridor.

### 3.12.13 Electric Lightwave (EL)

Underground EL lines are located within the corridor at 200 South in an abandoned gas line (crosses 400 West) and on the University of Utah campus. The campus lines run longitudinally within the corridor between Central Campus Drive on South Campus Drive and on Wasatch/Medical Drive. The portion on South Campus Drive is underground against the south curbline. The portion of Wasatch/Medical Drive is piggy-backed with other communication facilities and with University utilities.

Overhead EL lines are located within the corridor on North Temple between I-215 and 600 West, and on 500 South between 1000 West and 1300 East.

### 3.12.14 Utah Power and Light (UP&L)

UP&L has some underground lines within the corridor. Many of the power lines in the corridor are overhead. The treatment of these lines will be affected by the power requirements of the LRT electrification system. Further coordination with UP&L is required to fully define their existing and future facilities within the corridor.

### 3.12.15 Questar Gas

At least 41 gas line crossings were identified in the corridor. Sizes range from 1.25-inch to 16-inch. 32 of the 41 crossings are 6-inch or less. Major crossings include: North Temple just east of I-215 (16-inch), North Temple at 1000 West (16-inch), 400 West at 200 South (16-inch), 400 South at 200 West (16-inch), and 400 South at 1000 East (16-inch). There is a potential longitudinal conflict with a 10-inch line on 400 South between 200 East and 400 East.

## 3.13 AIR QUALITY

The EPA has established National Ambient Air Quality Standards (NAAQS) to protect the public from air pollution. The criteria pollutants included in the NAAQS are carbon monoxide (CO), ozone ($O_3$), nitrogen oxides ($NO_x$), sulfur dioxide ($SO_2$), particulate matter less than 10 microns ($PM_{10}$) and lead (Pb). Table 3.13-1 shows the NAAQS for the criteria pollutants and the percent of each pollutant contributed by mobile sources in the Wasatch Front Region. The table also includes volatile organic compounds (VOC), (also called hydrocarbons (HC)), and nitrogen oxides ($NO_x$) both of which are precursors to ozone.

**TABLE 3.13-1**
**NATIONAL AMBIENT AIR QUALITY STANDARDS**

| Pollutant | | Standard | | | Allowed Exceedances | On-Road Mobile Contribution - Typical 1995 Wasatch Front |
|---|---|---|---|---|---|---|
| | | ppm | µg/m³ | period | | |
| $O_3$* | | 0.08 | -- | 3-year average of fourth-highest 8-hour readings from each year cannot exceed standard | | |
| VOC ($O_3$ precursor) | | — | — | -- | -- | 36% |
| $NO_x$ ($O_3$ precursor) | | — | — | -- | -- | 46% (½ from diesel) |
| CO | | 9<br>35 | 10,000<br>40,000 | 8-hr<br>1-hr | 1 /year<br>1 /year | 89% |
| Particulates* | $PM_{10}$ | —<br><br>-- | 50<br><br>150 | Average of 3 yearly averages (each composed of averages of quarterly averages of 24-hour readings) must be below standard<br><br>Average of 3 yearly 99th percentile (24-hour) readings must meet standard | | 22% (1998 inventory) (3% direct $PM_{10}$, 59% indirect $NO_x$, 38% fugitive dust - includes off-road mobile) |
| | $PM_{2.5}$ | — | 15<br><br>65 | Average of 3 yearly spatial averages must be below standard; each yearly spatial average is average yearly reading of all monitored locations, composed of averages of quarterly averages of 24-hour readings<br><br>Average of 3 yearly 98th percentile (24-hour) readings must meet standard | | |
| $NO_x$ | | 0.05 | 100 | annual avg. | Mean | 50% |
| $SO_2$ | | 0.03<br><br>0.14<br>-- | 80<br><br>365<br>(1300) | annual avg.<br>24-hr<br>3-hr | Mean<br><br>1 /year<br>1 / year | --- |
| Lead (Pb) | | -- | 1.5 | 3-mo | Mean | --- |

* These standards were recent updates by the US EPA in 1997. The EPA is still in the process of implementing this change nationwide.

**Attainment Status**
Based on the monitoring data, EPA and DAQ have designated non-attainment areas for several pollutants in the region. These non-attainment areas are areas where the NAAQS are exceeded for a particular pollutant. DAQ has prepared State Implementation Plans (SIPs) for each of these areas to identify strategies for reducing pollutant levels to meet the standards.

Salt Lake County is a maintenance area for ozone. Ozone levels within Salt Lake County exceeded the NAAQS on one day each at two separate monitors during 1995 and on one additional day at one monitor in 1996. These exceedances did not result in a violation of the standards. Before 1995, the standards had not been exceeded since 1990. In light of this record, the DAQ submitted a redesignation request to EPA to designate Salt Lake County as an attainment area for ozone. EPA redesignated Salt Lake County as a maintenance area, and published this finding in the Federal Register on July 17, 1997. Recent exceedances occurred in June and July, 1998. Since the standards have been changed in 1997, EPA is reevaluating ozone attainment status for all areas in the United States, and the revised status is scheduled to be determined in the year 2000.

Salt Lake County was classified as non-attainment for $PM_{10}$ before the standards were revised in 1997. No exceedances of the old $PM_{10}$ standards have occurred since February 1996. At that time, two exceedances occurred at one station, but no violations of the standards resulted. The last violation of the $PM_{10}$ standard occurred in 1993. Since the standards have been changed in 1997, EPA is reevaluating $PM_{10}$ and $PM_{2.5}$ attainment status for all areas in the United States, and the revised status is scheduled to be determined in the year 2000.

Salt Lake City is designated as a non-attainment area for carbon monoxide. Again, no exceedances of the standard have occurred since December 1994. The CO standards have not been violated for the last 10 years. DAQ has submitted a request to redesignate Salt Lake City to attainment for CO.

# SECTION 4
# TRANSPORTATION IMPACTS AND MITIGATION MEASURES

## 4.1 DESCRIPTION OF TRANSPORTATION NETWORKS

The No-Build Alternative, including existing highway and transit networks, is described in Section 2. The following sections provide additional network information that was obtained from WFRC transportation planning models used to forecast ridership for each alternative.

### 4.1.1 No-Build and LRT-Build Bus Transit Networks

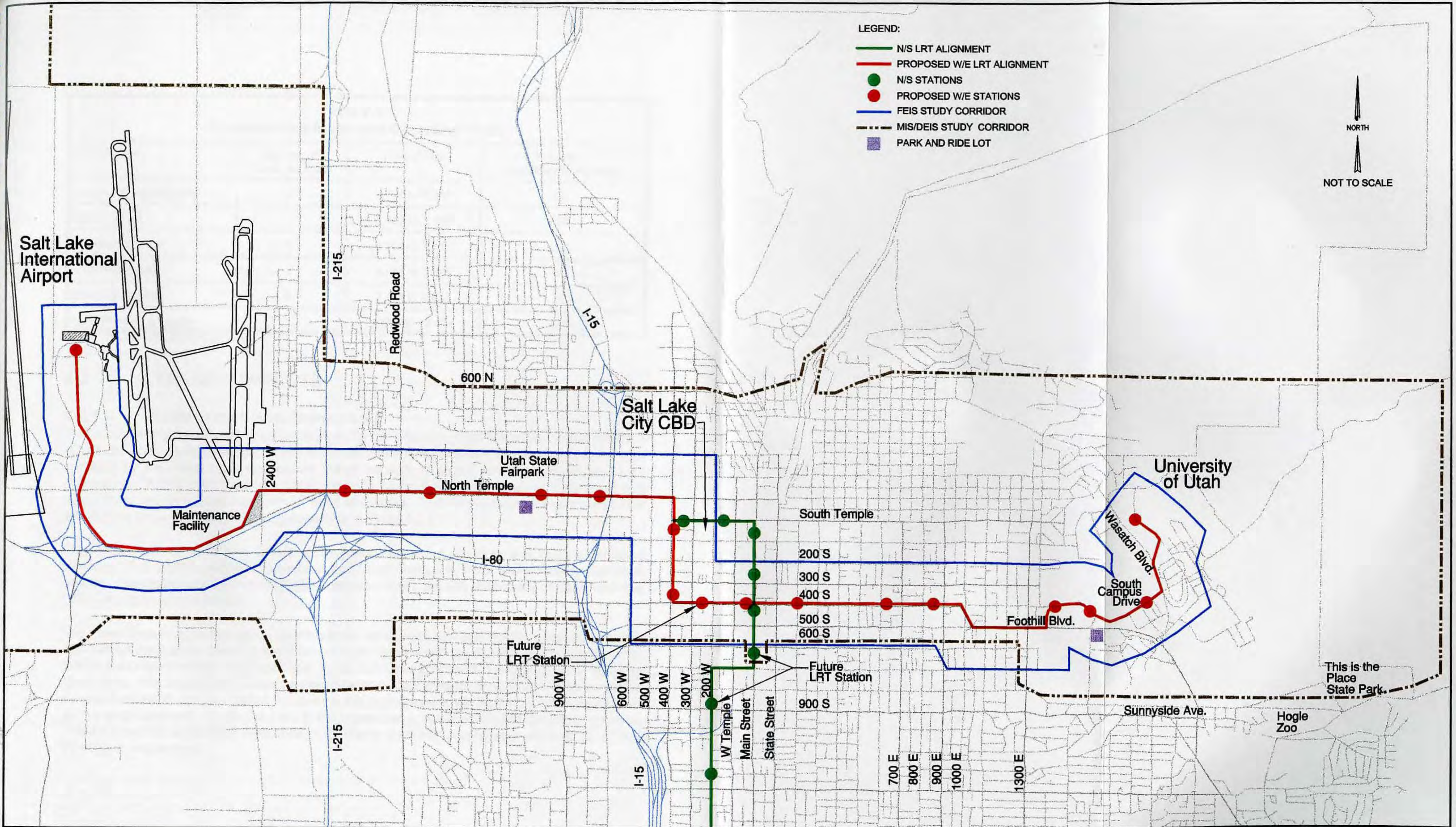
The No-Build background bus system is the configuration of bus routes and schedules being developed for implementation in support of the North-South LRT line. This bus system will provide local feeder service to LRT stations along the North-South Line. It will also provide a relatively high level of bus service in the West-East Corridor in order to provide collection/distribution connections to the North-South LRT line as well as provide transit access for trips beginning and ending in the corridor.

The background bus system assumed for the LRT-Build Alternative is very similar to the background bus network assumed for the No-Build Alternative. The primary difference is that a few west/east bus routes were eliminated because the LRT system would replace the service provided by those routes. Other local bus routes were shortened with the route terminating at one of the planned LRT stations.

### 4.1.2 Proposed LRT Alignment- Locally Preferred Alternative

A two-directional LRT line would be constructed to provide high capacity and dependable transit service in the 10.9 mile West-East Corridor between the Salt Lake City International Airport (SLCIA) and the Health Sciences Center at the University of Utah. LRT, with 21.8 miles of one-way track, would serve as the primary mode of travel for transit within the West-East Corridor. Figure 4.1-1 shows the West-East Corridor LRT alignment.

The approximate one way travel time is 40 minutes including turnaround. The approximate round trip travel time is 80 minutes. The overall hours of operation are from 5 AM to 12 AM. Table 4.1-1 shows the proposed headways and operating hours for the West-East LRT. Based on current ridership projections, LRT service frequency, during peak and off peak times, is appropriate to meet demands.




WASATCH FRONT REGIONAL COUNCIL
420 West 1500 South, Suite 200
Bountiful, Utah 84010

PARSONS TRANSPORTATION GROUP
DE LEUW, CATHER & COMPANY

# West-East LRT Alignment Including Proposed Station Locations

Figure 4.1-1

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| Table 4.1-1<br>Proposed Headways and Operating Hours | | | |
|---|---|---|---|
| **Time Period** | **Number of Cars per Train** | **Time of Day** | **Frequency (headway in minutes)** |
| Early Morning off peak | 2 | 5 AM to 6 AM | 30 |
| Morning peak | 2 | 6 AM to 9 AM | 10 |
| Midday- off peak | 2 | 9 AM to 4 PM | 20 |
| Afternoon peak | 2 | 4 PM to 7 PM | 10 |
| Evening off peak | 2 | 7 PM to 9 PM | 20 |
| Late Evening off peak | 1 | 9 PM to 12 AM | 30 |

Source: UTA LRT Operations Department

# 4.2 TRANSIT IMPACTS

## 4.2.1 Total Travel Time Comparison

The computer transit network used for analysis by the Wasatch Front Regional Council (WFRC) to forecast future travel demand contains estimated travel times between any two points in the area modeled by the computer. A separate transit network is coded for the No-Build and LRT Alternatives. WFRC used the travel time information for these two alternatives to compare transit travel times between selected points for each alternative. This comparison of total transit travel time for the projected year 2020 is summarized in Table 4.2-1.

The 2020 analysis compared transit travel times between four origin and three destination locations. The origin locations analyzed included South Salt Lake, West Valley, Sandy and West Jordan. The destination locations included downtown Salt Lake City, University of Utah, and Salt Lake City International Airport.

The travel times from each origin to downtown did not change between the No-Build and the LRT Alternatives because no travel on the West-East LRT line is involved. For the LRT Alternatives trip time to the University was unchanged from South Salt Lake and Sandy compared to the No-Build Alternative. Trip time to the University was reduced by four minutes from West Valley and three minutes from West Jordan. Transit trip times to the airport were lower for the LRT Alternative from all four origin locations. South Salt Lake to the airport had a reduction in travel time of 25 minutes. Travel time to the airport from West Valley City, Sandy and West Jordan were reduced 23, 27 and 19 minutes respectively.

| Table 4.2-1<br>Total Travel Time Comparison for Year 2020<br>(minutes - peak times) | | | |
|---|---|---|---|
| From | To | No-Build | Build |
| So. Salt Lake | Downtown | 30 | 30 |
| | University | 56 | 56 |
| | Airport | 83 | 58 |
| West Valley City | Downtown | 48 | 48 |
| | University | 76 | 72 |
| | Airport | 83 | 60 |
| Sandy | Downtown | 46 | 46 |
| | University | 81 | 81 |
| | Airport | 137 | 110 |
| West Jordan | Downtown | 74 | 74 |
| | University | 101 | 98 |
| | Airport | 105 | 86 |

Source: WFRC travel demand analysis

Reductions in travel times with the LRT Alternative are not necessarily expected to come from reduced automobile volumes, but rather for two other reasons. First, unlike buses, LRT will operate in its own exclusive right-of-way and, therefore, will essentially be unaffected by vehicle congestion that will continue to increase over time in the other travel lanes. In addition, traffic signals along the LRT route will be interconnected by means of the automated traffic management system (ATMS) now being installed as part of the I-15 Reconstruction project. This will make it possible for LRT vehicles to progress through a coordinated traffic signal system that will maintain relatively continuous flow through intersections between each pair of LRT stations. The exclusive right-of-way and advantageous signal phasing will result in transit travel time reductions for the LRT system.

### 4.2.2 Forecast of Transit Ridership

This section evaluates the impact of the LRT Alternative on overall transit demand. The change in total transit trips between existing conditions, the No-Build Alternative and the LRT Alternative are evaluated. Overall transit ridership is tabulated based on number of persons boarding transit vehicles over a given period of time.

Forecasts of future daily and annual transit ridership for the year 2020 in the UTA service area were made by the Wasatch Front Regional Council (WFRC). These forecasts were generated using the MINUTP travel demand forecasting software, which is the standard software utilized for this purpose throughout the country. WFRC's Travel Demand Model projects future traffic and transit volumes based on delay and congestion. The model forecasts weekday travel activity and includes commuter and daily activities.

Transit ridership estimates are determined by two principal factors. The first is the size of the travel market in the corridor or area served. The second is the share of the market that will use public transit.

The size of the market is determined primarily by demographic and employment estimates. The number of households, the number of persons per household and the number of autos owned are the principal residential factors used to predict the number of trips made. The other factor of significance in the estimation process is the number of jobs and the percent of the jobs in retail trade. The demographic and employment factors are used to predict the number of trips made and the beginning and ending point of the trips. The trips are broken down by the primary purpose of the trip (home to work, home to other, trips that do not begin or end at home, commercial and external).

The percentage of trips using public transit or the market share is determined by comparing the relative performance of the competing modes (single occupant auto, shared ride and transit). The performance of each mode is measured by its travel time and cost. The travel time is separated into out of vehicle time (walking or waiting) and in vehicle time. The out of vehicle time is weighted twice as heavily as the in vehicle time. The relative cost is also taken into account. The relative performance will result in different shares based on household auto ownership and whether the trip ends in the CBD.

The West-East Corridor contains a number of activity centers and special person trip generators that are difficult to accurately quantify using the WFRC travel demand models. These include facilities such as the following:

- LDS Church Downtown Campus
- Utah State Fairpark
- Delta Center
- Salt Lake Arts Center
- Abravanel Hall
- Salt Palace Convention Center
- Capitol Theater
- John W. Gallivan Utah Center
- Hansen Planetarium
- Fine Arts Museum/Museum of Natural History at the University of Utah
- Pioneer Memorial Theater
- Kingsbury Hall
- Rice-Eccles Stadium
- John M. Huntsman Center

All of the above special trip generators are considered to be within a reasonable walking distance of the West-East LRT. There are additional special generators that could easily be accessed in the West-East Corridor by existing or potential future transit service. To completely understand the West-East Corridor and the potential for transit ridership, these special generators need to be taken into consideration. Increased transit ridership as a result of special generators is likely to occur whenever the level of transit service to those facilities is increased. Since LRT will provide a higher level of transit service in the corridor, it is likely that LRT will succeed in motivating a higher percentage of participants and spectators attending events at special generators to use transit as their mode of transportation. As will be discussed later, experience in other cities where LRT is operating has shown that LRT tends to be more attractive than bus services for many of these users. LRT is therefore likely to attract a higher number of transit trips to special generators in the corridor.

In order to formulate an accurate forecast of 2020 auto and transit trips in the corridor and in the region, it was necessary to start with the WFRC travel demand forecasts and then add the additional auto and transit person trips that are likely to be attracted by special generators. An explanation of each step in this forecasting process is presented in the following sections.

**WFRC Travel Demand Forecasts**
The WFRC travel demand forecasting models were used to forecast future travel demand for the year 2020 under both the No-Build and the LRT Alternatives. These travel demand forecasts for the year 2020 are based on an estimate of the total number of persons boarding transit in the forecast year. A comparison of overall daily and annual transit ridership compared to 1997 conditions is summarized in Table 4.2-2.

**Table 4.2-2**
**Overall Annual Transit Ridership**

| | 1997 | 1997 | 2020 No-Build | 2020 Build-LRT |
|---|---|---|---|---|
| | UTA System | WFRC Study Area | | |
| Daily | 82,173 | 65,000 | 136,860 | 140,900 |
| Annually | 24,158,862 | 19,110,000 | 40,236,840 | 41,424,600 |

Source: WFRC travel demand analysis, UTA Operations Dept.

In the year 1997, the UTA bus system carried 82,173 passengers on an average weekday. At present, UTA has limited bus service on Saturday and none on Sunday. For the entire year of 1997, UTA carried a total of 24,158,862 passengers. Based on this daily and annual passenger information, it was established that annual ridership can be estimated from daily ridership by using a conversion factor of 294. This conversion factor was used in the study whenever it was necessary to convert from daily riders to annual riders.

The UTA bus system covers a larger geographic area than the area included in the WFRC model area. The WFRC model area, for example, does not include Utah County or the northern portions of Davis County. Within the WFRC model area, it is estimated that approximately 65,000 transit trips were made on a daily basis in 1997. Using the annualization factor of 294, it is estimated that UTA accommodated 19,110,000 passengers within the WFRC model area during the year 1997.

The WFRC ridership forecast for the year 2020 under the No-Build Alternative, which includes the North-South LRT line and an adjusted bus system to serve that LRT line, is 136,860 passengers per day and 40,236,840 passengers per year. For the LRT Alternative, the 2020 ridership forecast is 140,900 passengers per day and 41,424,600 passengers per year. Annual ridership was calculated as the equivalent of 294 times the average weekday ridership.

Based on the ridership forecasts summarized in Table 4.2-2, the LRT Alternative attracts 4,040 new transit rider per day, or 1,187,760 new transit riders annually. This means that the LRT Alternative is forecast to carry three percent more transit passengers compared to the No-Build Alternative.

**Special Trip Generators in the Corridor**

The following sections describe the methodology used to estimate the potential increase in annual ridership from special generators. The potential annual ridership from special generators was then added to the potential annual ridership of normal daily travelers estimated (on an average weekday basis) from the WFRC Travel Demand Model. Special generators were reviewed as to their West-East Corridor transit ridership potential. These generators were considered to be within reasonable walking distance of the West-East LRT alignment. While most of these facilities have some special generator functions, the person trips related to full time employees have already been accounted for in the WFRC Travel Demand Model. The facilities that are felt to have the largest potential as special generators of non-employment person trips are reviewed in the following subsections.

**The Church of Jesus Christ of Latter-day Saints (LDS) Downtown Church Campus**

The LDS Downtown Church Campus is comprised of approximately 15 existing facilities and one new major planned facility. These facilities comprise the headquarters of the LDS Church, with functions ranging from administrative to religious to tourist related. The buildings in the church campus include:

- Joseph Smith Memorial Building
- Salt Lake Temple
- Temple Square
- Planned LDS Assembly Building
- Relief Society Building
- Brigham Young's House
- Family History Library
- Museum of Church History and Art
- Church Office Building
- Church Administration Building
- Beehive Clothing
- Lion House

The heart of the campus is located between West Temple and State Street, from North Temple to South Temple. The Church owns additional properties to the north and west of these areas, where additional growth could be envisioned in the future. A summary of annual visitors to the LDS Church Campus is presented in Table 4.2-3.

**Table 4.2-3**
**LDS Church Campus Visitors**

| Special Generator | Annual Visits |
|---|---|
| Joseph Smith Memorial Building | 1,805,600 |
| Salt Lake Temple | 400,000 |
| Temple Square | 5,000,000 |
| Planned Assembly Building (anticipated completion date: March 2000) | 1,200,000 |
| Family History/Museum of Church History-Art | 1,095,300 |
| **TOTAL** | **9,500,900** |

Source: LDS Church Public Information Office

**Utah State Fairpark**
This major center of activity hosts numerous activities of different sizes throughout the year. Th largest crowds are attracted to the Utah State Fair that is held for several weeks in Septembe The estimated attendance to the Utah State Fair is **330,000**.

**Fine Arts Museum/Museum of Natural History**
The Fine Arts Museum and the Museum of Natural History both are located at the University c Utah. The combined total annual visitors to these facilities is over **152,000**.

**Delta Center**
The Delta Center is located at South Temple and 400 West adjacent to the terminus of the North South LRT line which is presently under construction. This 20,000-seat arena is currently hom to the National Basketball Association's Utah Jazz and the Women's National Basketba Association Utah Starzz. The Delta Center will be one of the major facilities for the 2002 Winte Olympics as it will host figure skating and other events. The arena also holds concerts, circuse ice shows and other various events. The annual visitor estimates for the Delta Center are a follows:

| | |
|---|---|
| Utah Jazz Attendance | 917,400 |
| Other Event Attendance | 556,800 |
| **Delta Center Total Annual Attendance** | **1,474,200** |

**Salt Lake Arts Center**
The Salt Lake Arts Center is a contemporary art center located at 20 South West Temple nea Crossroads Mall. The center has two levels and usually hosts one event per floor. Approximatel **89,000** persons visit the Salt Lake Arts Center each year.

**Abravanel Hall**
This symphony hall is the home of the Utah Symphony and various other concert events. Man high school graduation ceremonies and dances have also been held here in the past. Located o the southwest corner of South Temple and West Temple, on the same block as the Salt Palac Convention Center, this facility hosted a total of 201 events in 1995. The annual number of patron frequenting these events in 1995 was **322,200**.

**Salt Palace Convention Center**
The Salt Palace Convention Center was recently remodeled and upgraded to a major destinatio facility. Estimated annual visitors to the Salt Palace Convention Center is based on two source The Salt Palace is rented through the Visitor's Bureau and through private contract. According t the Visitor's Bureau, there were 225,182 visitors related to Visitor Bureau conventions and 5 private contract conventions in 1996. Unfortunately, no visitor number records are available for th private conventions. It was, therefore, conservatively assumed that the Visitor's Bureau compris 70 percent of the annual visitors to the Salt Palace. Therefore the total estimated visitors wa approximated at **321,700**.

**Rice-Eccles Stadium**
Rice-Eccles Stadium is home of the University of Utah football team. The stadium hosts about fiv home games per year and one or two high school football games per year. The stadium has bee recently expanded to accommodate 46,000 persons for football games. An additional 5,000 ca be accommodated for other events. Combining football games with other events held at th stadium, it is estimated that there are **400,000** visits annually.

**Jon M. Huntsman Center**

The Huntsman Center is the host site of the University of Utah basketball and gymnastics events. A breakdown of the projected annual attendance for the center beginning July 1, 1996 is as follows:

| | |
|---|---|
| Concerts | 50,000 |
| High School Basketball | 40,000 |
| Graduations | 24,000 |
| Men's Basketball | 208,000 |
| Women's Basketball | 16,000 |
| Women's Gymnastics | 48,000 |
| NCAA Basketball | 30,000 |
| Basketball Camps | 14,000 |
| **Huntsman Center Total Annual Attendance** | **430,000** |

**Capitol Theater**

The historic Capitol Theater is located between Main Street and State Street on 200 South. It is the housing for various fine theatrical presentations performed by Ballet West, the Repertory Dance Theater, the Ririe-Woodbury Dance Company, the Theater League of Utah, and the Utah Opera Company. Capitol Theater hosted a total of 241 performances in 1995, welcoming 364,700 patrons. From January 1996 to November 1996, 254 events were held with a total of **417,000** patrons in attendance.

**Pioneer Memorial Theater**

The Pioneer Memorial Theater seats 1,000 patrons and is the home of the Pioneer Theater Company. Annual productions at the theater range from classical to contemporary plays and musicals. The season runs from mid September to the end of May with seven different productions per year. The performances run six nights a week with an occasional matinee on Saturday. The theater hosts approximately 140 annual performances with slightly over **100,000** people attending each year.

**Kingsbury Hall**

Kingsbury Hall is located on the University of Utah campus and hosts many various performances, such as Broadway shows, dramas, musicals, dance concerts, lectures and magic shows. The Hall was closed due to renovation for two years, but has been open for the past six months. Based on the number of audience members and performers during the past six months, an annual number of **231,500** people are expected to attend.

**John W. Gallivan Utah Center**

This outdoor center hosts a large variety of events year-round. The Center is located between State Street and Main Street on 200 South and consists of an outdoor amphitheater and ice skating rink. The annual Salt Lake City Classic Run begins here and draws about 5,000 runners. "Pasta on the Plaza" is also held at the center the night before the race and draws up to 3,000 people if the weather is good. In addition to these events, there were approximately 193,000 visitors from scheduled events during 1996.

| | |
|---|---|
| Salt Lake City Classic Run | 5,000 |
| Pasta on the Plaza | 3,000 |
| Misc. Events | 193,000 |
| **Gallivan Center Special Events** | **201,000** |

**Hansen Planetarium**

The Hansen Planetarium is located between South Temple and 200 South on State Street. I houses the Space Science Library, a museum and an exhibit hall. The planetarium generate: various laser shows and currently hosts over **200,000** visits per year.

**Summary of Special Generator Trip Generation**

The estimated number of annual visits to special generators is summarized in Table 4.2-4. It i: estimated that 14,169,500 people will attend activities at these special generators on an annua basis.

| Table 4.2-4<br>Special Generator Person Trips | |
|---|---|
| Special Generator | Annual Visits |
| LDS Church Campus | 9,500,900 |
| Utah State Fair Park | 330,000 |
| Delta Center | 1,474,200 |
| Salt Lake Arts Center | 89,000 |
| Abravanel Hall | 322,200 |
| Salt Palace Convention Center | 321,700 |
| Capitol Theater | 417,000 |
| John W. Gallivan Utah Center | 201,000 |
| Hansen Planetarium | 200,000 |
| Fine Arts Museum/Museum of Natural History | 152,000 |
| Pioneer Memorial Theater | 100,000 |
| Kingsbury Hall | 231,500 |
| Rice-Eccles Stadium | 400,000 |
| John M. Huntsman Center | 430,000 |
| **Total of Special Generators** | **14,169,500** |

Source: Individual contacts with each organization.

**Forecast of Daily and Annual Transit Trips for Special Generators**

As indicated in Table 4.2-4, special generators in the corridor generate 14,169,500 visits per yeaı Since each visitor to a special generator represents two person trips, one for arriving and one fo departing, special generators produce 28,339,000 person trips annually. Using the factor of 29 to convert from annual to daily trips yields an estimate of 96,391 daily person trips from specia generators. Many of these person trips are made by people who walk to or from the specia generator locations, such as from a hotel or from another special generator. In a given day, for example, a tourist from out of town is likely to stay at a downtown hotel and visit several special generator locations by walking. A large percentage of the person trips generated by special generators is therefore walk trips and not auto or transit trips. For the purposes of this analysis, the conservative assumption was made that 35 percent of the person trips related to special generators will be made by auto or by transit. The estimated number of daily person trips related to special generators by auto and transit is summarized in Table 4.2-5.

**Table 4.2-5**
**Daily Trips to Special Generators by Auto and Transit**

| | No-Build | | Build - LRT | |
|---|---|---|---|---|
| | Percent | Person Trips | Percent | Person Trips |
| Auto | 30% | 28,917 | 20% | 19,278 |
| Transit | 5% | 4,820 | 15% | 14,459 |
| **Total** | **35%** | **33,737** | **35%** | **33,737** |

Source: De Leuw, Cather special generator analysis - January 1999

For the No-Build Alternative, it was assumed that 30 percent of the special generator trips would be made by auto and 5 percent would be made on transit. This results in a forecast of 28,917 daily auto trips and 4,820 daily transit trips. For the LRT Alternative, it was assumed that 20 percent of the trips would be made by auto and 15 percent would be made by transit. This results in a forecast for the LRT alternative of 19,278 daily trips by auto and 14,459 daily trips by transit. The total number of trips remains the same at 33,737 person trips for both alternatives.

The number of daily person trips by transit was further divided into those by bus and those by LRT. The results of this analysis are presented in Table 4.2-6.

**Table 4.2-6**
**Daily Transit Trips for Special Generators by Mode**

| | No-Build | | Build-LRT | |
|---|---|---|---|---|
| | Percent | Person Trips | Percent | Person Trips |
| Transit-Bus | 50% | 2,410 | 25% | 3,615 |
| Transit-N-S LRT | 50% | 2,410 | 40% | 5,783 |
| Transit-W-E LRT | 0% | 0 | 35% | 5,061 |
| **Total** | **100%** | **4,820** | **100%** | **14,459** |

Source: De Leuw, Cather special generator analysis - January 1999

For the No-Build Alternative, it was assumed that 50 percent of the transit trips would be by bus and 50 percent would be by North-South LRT. This resulted in a forecast for the No-Build Alternative of 2,410 daily person trips each for both bus and North-South LRT.

For the LRT Alternative, it was assumed that 25 percent of the transit person trips to special generators would be by bus and 75 percent would be by LRT. The estimate of 75 percent by LRT was further broken down into 40 percent by North-South LRT and 35 percent by West-East LRT.

This resulted in a forecast for the LRT Alternative of 3,615 daily person trips by bus, 5,783 dail person trips by North-South LRT and 5,061 daily person trips by West-East LRT.

**Future Total Daily Transit Passengers**

Forecasts of future total daily transit passengers were formulated for both the No-Build and LR Alternatives by adding the forecast of transit trips from special generators to the forecast of transi trips produced by the WFRC computer forecasting model. These forecasts are summarized i Table 4.2-7.

**TABLE 4.2-7**
**Future Total Daily and Annual Transit Passengers**

| | | Existing | No-Build Alternative | LRT Alternative | Change in Ridership: No-Build to LRT |
|---|---|---|---|---|---|
| **WFRC RIDERS** | | | | | |
| | Bus | 65,000 | 113,860 | 104,700 | -9,160 |
| | N-S LRT | 0 | 23,000 | 24,500 | 1,500 |
| | W-E LRT | 0 | 0 | 11,700 | 11,700 |
| Subtotal | | 65,000 | 136,860 | 140,900 | 4,040 |
| **SPECIAL GENERATOR RIDERS** | | | | | |
| | Bus | 0 | 2,410 | 3,615 | 1205 |
| | N-S LRT | n/a | 2,410 | 5,783 | 3,373 |
| | W-E LRT | n/a | 0 | 5,061 | 5,061 |
| Subtotal | | 0 | 4,820 | 14,459 | 9,639 |
| GRAND TOTAL | | 65,000 | 141,680 | 155,359 | 13,679 |
| Annual Riders | | 19,110,000 | 41,653,920 | 45,675,546 | 4,021,626 |
| **LRT RIDERSHIP SUMMARY** | | | | | |
| N-S LRT | | 0 | 25,410 | 30,283 | 4,873 |
| W-E LRT | | 0 | 0 | 16,761 | 16,761 |
| TOTAL | | 0 | 25,410 | 47,044 | 21,634 |

Source: WFRC travel demand analysis and De Leuw, Cather special generator analysis

Based on this forecast 16,761 daily boardings are anticipated on the West-East LRT line Additionally, with the addition of the West-East LRT line, ridership on the North-South LRT line increases by 4,873 passengers bringing the total increase in daily LRT system ridership to 21,634

As indicated in Table 4.2-7, implementing the West-East LRT system will generate 13,679 additional transit passengers per day over the No-Build Alternative and 4,021,626 more riders on an annual basis. This results in a total ridership on the two LRT lines of 47,044 passengers by the year 2020.

### 4.2.3 Summary and Comparison of Transit Person Trips

The following sections provide a summary of forecast total person trips by mode for the WFRC model area along with comparisons of existing and future person trips for three specific locations: Salt Lake City International Airport, Downtown Salt Lake City and the University of Utah.

**Forecast of Total Person Trips by Mode**

As explained previously, WFRC travel demand forecasts do not include all person trips related to special generators. The forecast of special generator person trips was presented previously in this section. A forecast of total daily person trips for the year 2020 was obtained by adding the forecast of special generator person trips to the WFRC forecast of person trips. With this forecast of total person trips, it was possible to tabulate and compare the relative percentage of person trips divided between auto and transit. The tabulation of total daily person trips by mode was done for both the West-East Corridor and the entire region. The resulting mode split comparison is presented in Table 4.2-8.

**Table 4.2-8**
**Percentage of Total Person Trips by Mode**

| | No-Build | Build LRT |
|---|---|---|
| **Corridor** | | |
| Auto | 95.6 | 94.4 |
| Transit | 4.4 | 5.6 |
| **Total** | **100.0** | **100.0** |
| **Region** | | |
| Auto | 98.4 | 98.1 |
| Transit | 1.6 | 1.9 |
| **Total** | **100.0** | **100.0** |

Source: WFRC travel demand analysis

For the West-East Corridor under the No-Build Alternative, it is forecast that 4.4 percent of the trips will be made by transit and 95.6 percent by auto. For the entire region under the No-Build Alternative, it is forecast that 1.6 percent of the person trips will be made by transit and 98.4 percent by auto. One of the reasons that the percentage of person trips by transit is higher in the West-East Corridor compared to the entire region is because of the strong attraction of the North-South LRT line that would be serving the corridor. There are also higher concentrations of population and employment in the corridor that make transit ridership generally more attractive.

The percentage of transit trips increases for the LRT Alternative in the corridor and in the region. For the West-East Corridor with the LRT Alternative, it is forecast that 5.6 percent of the daily trips will be made by transit and 94.4 percent by auto. For the entire region, it is forecast that 1.9 percent of the person trips will be made by transit and 98.1 percent by auto. With the LRT

Alternative, the relative attractiveness of transit in the corridor is even higher compared to the entire region. The estimate of 5.6 percent of person trips by transit in the corridor is again higher than the 1.9 percent of transit trips in the entire region. It should also be noted that for both the corridor and the entire region, the percentage of transit trips is higher with the LRT Alternative compared to the No-Build Alternative.

**Daily Person Trips - Salt Lake City International Airport**

A summary of daily person trips in 1993 and in the year 2020 at the Salt Lake City International Airport (SLCIA) is presented in Table 4.2-9.

**Table 4.2-9**
**Daily Person Trips - SLCIA**

| | 1993 | 2020 Build-LRT |
|---|---|---|
| Auto | 75,258 | 114,500 |
| Transit | 742 | 3,500 |
| **Airport Total Daily** | **76,000** | **118,000** |

Source: WFRC travel demand analysis

In 1993, SLCIA attracted an average of 76,000 person trips per day. Of this total, 742 person trips were made by transit, representing a transit ridership percentage of 1 percent. By the year 2020 it is estimated that SLCIA will attract 118,000 person trips per day. For the LRT Alternative, it is forecast that 3,500 of these trips would be made by transit, including both bus and LRT. This represents a transit ridership percentage of 3 percent compared to 1 percent today.

The estimate of 3,500 person trips per day by transit to SLCIA in the year 2020 was generated by the WFRC travel demand forecasting model. It represents a very conservative estimate. Based on experience in other cities where rail transit access is available to a major airport, the transit ridership share could go as high as 10 percent, particularly during seasonal peak periods when parking lots are close to capacity. A transit share of 10 percent would generate a daily ridership of 11,450 passengers which would provide substantial relief to airport access and parking during peak days of travel activity. Transit access to SLCIA will be particularly important during the Winter Olympic Games in 2002.

**Daily Person Trips - Downtown Salt Lake City**

A comparison of daily person trips in 1993 and in the year 2020 to and from downtown Salt Lake City is summarized in Table 4.2-10.

**Table 4.2-10**
**Daily Person Trips - Downtown Salt Lake City**

| | 1993 | 2020 Build-LRT |
|---|---|---|
| Auto | 364,800 | 420,000 |
| Transit | 15,200 | 21,000 |
| **Total Downtown** | **380,000** | **441,000** |

Source: WFRC travel demand analysis

In 1993, downtown Salt Lake City attracted 380,000 person trips per day. Of this number, 15,200 were made by transit. This represents a transit ridership percentage of 4.0 percent. By the year 2020 it is forecast that downtown Salt Lake City will attract 441,000 person trips per day. With the LRT Alternative, it is estimated that 21,000 of these trips will be made by transit. This represents a transit ridership percentage of 4.8 percent compared to 4.0 percent in 1993.

As with SLCIA, transit is likely to carry much higher volumes of riders during major events and seasonal peak periods. On peak days when high activity levels are being experienced in the downtown area, daily transit ridership could be as high as 63,000 representing 15 percent of the trips. For example, on the days of a major event at both the Delta Center and the LDS Assembly Building, a total of 42,000 persons would be traveling to the two locations above. This would be in addition to the daily users forecast in the WFRC travel demand estimates.

It is planned that award ceremonies will be held downtown each evening during the 2002 Winter Olympic Games. These ceremonies are expected to attract up to 17,000 persons each evening. This is in addition to all the other travel by Olympic media, participants and spectators. High capacity light rail, with flexibility to adjust to changing travel demand in a short period of time, will be an important element of the overall Olympic transportation system. Light rail can provide a high speed link to remote parking during peak periods of Olympic activity.

**Daily Person Trips - University of Utah**

The University of Utah has one of the highest rates of person trip attraction in the State of Utah. The number of daily person trips in 1993 and in the year 2020 to and from the University of Utah is summarized in Table 4.2-11.

**Table 4.2-11**
**Daily Person Trips - University of Utah**

| | 1993 | 2020 Build-LRT |
|---|---|---|
| | Person Trips | Person Trips |
| Auto | 93,071 | 133,000 |
| Transit | 6,929 | 10,000 |
| **U of U Total** | **100,000** | **143,000** |

Source: WFRC travel demand analysis

The University attracted an average of 100,000 person trips per day in 1993. As the result of an aggressive transit ridership program, the bus system accommodates an average of 6,929 trips per day by transit. This represents a transit ridership percentage of 6.9 percent. In the year 2020, it is estimated that the University will attract 148,000 person trips per day. With the LRT Alternative, 133,000 persons will arrive by auto, and 10,000 by transit representing 93 percent and 7 percent of the person trips respectively.

As was discussed previously, WFRC travel demand estimates are conservative and represent average weekday ridership projections. The University of Utah frequently experiences major event or activity days when transit ridership is likely to be considerably higher. A 10 percent transit share would generate 14,300 trips per day and a 20 percent share would generate 28,600 trips per day. Rice-Eccles Stadium was recently expanded to 51,000 seats for some events. It is not uncommon, at other major sports centers across the country that have rail transit access, to have 20 percent or more of the event attendees travel to the event via rail transit. Rice-Eccles Stadium will be ıe location for the opening and closing ceremonies for the 2002 Winter Olympic Games.

**Travel Related to 2002 Winter Olympics**
Salt Lake City will soon join the prestigious list of cities to host the Olympic games in Februar of 2002. Along with this honor comes many challenges, not the least of which is moving peopl to and from the event venues. This section discusses venues, lodging areas and traffic volures expected to be produced by the Olympic games within the study area.

The Olympic venues located within the study area are listed in Table 4.2-12 along with their locaon and planned capacity. These venue locations are subject to change.

**Table 4.2-12**
**OLYMPIC EVENT VENUES AND CAPACITIES WITHIN STUDY CORRIDOR**

| Discipline | Location | Capacity |
|---|---|---|
| Ceremonies | Olympic Stadium | 50,000 |
| Ice Hockey | Delta Center | 15,000 |
| Figure Skating | Delta Center | 15,000 |

Source: SLOC

**Lodging**
Lodging for the Olympics will be provided throughout the Wasatch Front and surrounding ares. The lodging capacity of areas expected to provide housing for Olympic events along the alignmnt and the approximate percentage of Olympic housing in that zone are summarized in Table 4.2-3.

**Table 4.2-13**
**LODGING CAPACITY OF EACH ZONE**

| Code | Location | Capacity | % |
|---|---|---|---|
| Z1 | Zone 1 | 30,200 | 2 |
| Z3 | Zone 3 | 4,420 | |
| A | Olympic Village (U of U) | 4,000 | |
| Q | Nordic Village | 700 | |
| KK | Media Village (Fairgrounds) | 4,500 | |
| C | Media Center | 5,000 | |
| | **Total** | **48,820** | **4** |

Source: SLOC

As indicated in Table 4.2-13, it is estimated that 47 percent of all lodging anticipated to be usd during the Olympics is adjacent to the West-East Corridor. Besides providing general lodgingor Olympic patrons, the light rail alignment also will provide transportation access for the Media Villge located at the Utah State Fairpark, the Media Center located near the Delta Center, the Noiic Village and for the Olympic Village located at the University of Utah.

**Predicted Olympic Traffic Volumes**
The peak traffic day predicted for the Olympic games is February 11, 2002. Presented in this section is an estimate of person trips related to Olympic activity. The estimate does not include an allocation to alternative transportation modes. It has been suggested that the ticket price for each event include the price of a transit ticket to the venue. The West-East LRT line would be able to accommodate a greater number of passengers than the current bus system. If the spectators, athletes and media personnel are encouraged to use the transit system, the number of vehicular trips within the study area can be reduced dramatically. The predicted one-way peak person trips for selected road segments are shown in Table 4.2-14.

**Table 4.2-14**
**PREDICTED ONE-WAY PEAK PERSON TRIPS FOR SPECIFIC ROAD SEGMENTS**

| Road Segment | Date | One Way Peak Traffic |
|---|---|---|
| I-15 Northbound between I-80 to 600 South | February 11 | 17,093 |
| | February 16 | 13,726 |
| Northbound I-215 to Eastbound I-80 Ramp | February 11 | 9,725 |
| | February 16 | 8,000 |

Source: UDOT

Although these particular traffic volumes are not located within the West-East Corridor, they do give an indication of the amount of additional traffic that is anticipated during the period of Olympic activity. The SLCIA will obviously have a high concentration of Olympic-related traffic. An improved transit system in the West-East Corridor would provide an alternative to vehicular traffic and therefore reduce traffic volumes.

### 4.2.4 Corridor Bus Service
Included in the No-Build Alternative are the bus route and schedule adjustments that are now being planned in coordination with starting operation of the North-South LRT line. These bus service adjustments will be made without significant increase in bus miles and bus hours of service. The primary effects of the No-Build Alternative on bus services will be continued degradation of service reliability (travel time and on-time performance) on routes operating along increasingly congested roadways.

Under the LRT Alternative, future bus services in the West-East Corridor will be modified for improved service integration of bus with the West-East LRT line. UTA has determined, based upon financial considerations and service planning objectives, that substantial changes in overall bus service levels in the West-East Corridor would not be implemented as part of proposed project improvements.[1] A decrease in bus service would not be required to accommodate the addition of LRT service. The financial plan included in Section 6 of this document assumes that UTA will take action starting in the year 2012 to expand bus service throughout the UTA service area. This would occur several years after the West-East LRT project has been constructed and placed into operation and is therefore not considered part of the LRT Alternative.

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[1] Service levels are defined in terms of revenue vehicle bus miles operated daily or annually

Proposed bus service changes in the West-East Corridor related to implementation of LRT would include modifications to existing route alignments, changes in route schedule times, implementation of new feeder routes and/or elimination of existing routes or route segments. The purpose of these changes is to achieve better coordination of bus and LRT service along with improved efficiency and effectiveness of bus service in the corridor. On the whole, the effects on bus service would be considered beneficial, expanding access and improving reliability where congestion is reduced by the provision of LRT service.

The following paragraphs summarize the service changes proposed. At this time the proposed changes should be considered preliminary and subject to further review during final design and implementation of the proposed project. Any significant changes in bus routes or service levels would be presented to the public for review and comment prior to implementation. Furthermore, the UTA Board of Directors must approve any major service changes and will hold a public hearing(s) prior to making any decision on these matters.

**Salt Lake City International Airport and International Center**
The West-East LRT line would terminate at a new intermodal facility at Salt Lake City International Airport. The facility would enhance opportunities to access the LRT line as well as transfers among modes, including bus, rail, taxi/van and other. Several UTA fixed routes currently serve the airport: Routes 50, 51, 53, and 56.

Route 50 connects downtown Salt Lake City with the airport and the International Center located just west of the airport. Route 50 between the airport and downtown Salt Lake would duplicate LRT service along North Temple. A new, expanded shuttle service is proposed between the International Center and the proposed airport intermodal facility at the terminus of the LRT line. For these reasons, route 50 is proposed for elimination.

Route 51 provides limited, peak period only, express service from Tooele Valley to the airport and downtown Salt Lake City, with stops by request at the International Center. Weekday and Saturday trips would be modified to terminate at the intermodal facility with timed transfers to and from LRT for access to downtown Salt Lake City. Additional feeder trips from Tooele Valley would be provided through the savings in bus vehicle miles.

Routes 53 and 56 would be retained in their general current configuration, with the option for combining the segment of Route 53 to Tooele Valley with Route 51.

One other UTA route in the corridor, Route 34X, which does not currently serve the airport directly but continues from the Bangerter Highway then along North Temple to Downtown Salt Lake would be modified to terminate at the airport LRT station, eliminating the North Temple route segment.

A new shuttle service from the airport to the International Center is proposed as a combination peak period employee shuttle, with service to points throughout the center, and an all-day shuttle, with service to the commercial and hotel uses along Wiley Post Way and Amelia Earhart Drive. The services would be timed to meet West-East LRT trains at the intermodal facility.

**North Temple**
This is a heavy bus transit corridor with a number of crossing routes in addition to routes following North Temple and 200 South to and from downtown Salt Lake City. In general, proposed service changes in conjunction with West-East LRT would introduce a stronger grid system, especially north-south along such roadways as 2200 West, Redwood Road, 1200 West, and 900 West. Currently, there is little north-south through service north of I-80 between I-215 and I-15, and LRT

along North Temple opens up opportunities for improving these connections. Buses would provide timed transfer connections to LRT service on North Temple wherever possible. Potentially realigned routes for this purpose in the corridor include (proceeding west to east) Routes 26, 28, 37, 43, 48, 18, 75, 16, 17,19, 20, and 81.

Bus service along the West-East Corridor would be retained and reinforced. Most service along North Temple would be replaced by LRT service. However, a basic, core service along North Temple between I-215 to the downtown for local circulation would be maintained. Also, a local circulator service from LRT stations to the major state office buildings, including the Health Department, would be provided during peak travel times.

**Downtown Salt Lake City and 400 South**

With the implementation of North-South LRT service, the bus network in downtown Salt Lake City is being modified to become a stronger grid. The proposed Intermodal Center at 600 West and 200 South will provide a new hub for convenient connections among transportation modes.

West-East LRT service would not substantially affect the bus service improvements underway as part of the North-South LRT line in the downtown core. The primary changes proposed include minor route realignments for north-south bus routes crossing 400 South to better serve LRT stations. Routes would be redirected to cross at or near west-east stations, thereby making bus-rail transfers more convenient. Whenever possible, bus-rail connections would be timed to reduce wait times for persons transferring. However, the basic service grid system introduced as part of the North-South LRT would remain.

**400/500 South to University of Utah and Research Park**

Along 400 South proceeding east, a reduction in bus service duplicating the West-East LRT service is proposed, primarily in the off-peak. The primary routes affected serve east and southeast Salt Lake City. Peak service would be retained where demand warrants and travel time on the bus to downtown is lower than on LRT. However, during the midday and evening hours, when bus service frequencies decrease and ridership demand is less, buses would connect via timed-transfer to LRT at the University of Utah. A bus shuttle system will be planned and implemented to provide transit access to service areas in the vicinity of the University of Utah. This would include shuttle service to locations such as Research Park, Hogle Zoo, Arboretum and This Is The Place Heritage Park. The shuttle system would circulate between these facilities in addition to providing access to LRT stations near the east end of the line. Bus service from the southeast portion of Salt Lake City would also interface with the LRT system at these LRT stations in the vicinity of the University of Utah.

### 4.2.5 LRT Transit Service

The North-South LRT line is planned for opening by the year 2000. Ridership on this line, extending from South Temple at 400 West in downtown Salt Lake City to approximately 10000 South in Sandy along the former Union Pacific corridor, would be enhanced by proposed service along the West-East LRT line.

The two lines would cross at the intersections of 400 South at Main Street and 400 West at South Temple. Both of these locations would be major transfer points between the two LRT lines. From the transit user's perspective, the provision of West-East LRT service in conjunction with North-South LRT service would have a beneficial effect on transit access in both corridors. The overall rail network would be expanded and offer more coverage within the urban area. Transfer connections between the two services would be possible and convenient with both lines operating on the same, or closely the same, headways. More destinations would be accessible by rail, which typically offers a more reliable service than buses that must operate in congested, mixed-traffic conditions.

## 4.2.6 LRT Stations

Preliminary studies for LRT station access and design have been undertaken as part of the EIS process. These studies will be refined as part of the preliminary engineering and final design process. A total of 15 stations have been identified to date, which are anticipated to be operational at the time the West-East LRT line is opened in 2002.

LRT transit stations will be located approximately one-half mile apart. This spacing is required in order to maintain acceptable travel times and control system cost for stations. LRT stations would be constructed at key locations along the corridor.

For most of the corridor, the LRT would be designed to be located in the center of the street. The proposed cross section of the light rail corridor changes in the vicinity of the airport from a center running system to a right of way along the north side of the I-80 and airport access roadway. The light rail corridor is typically 28 feet across between stations and widens out to 41 feet at each station. The typical cross section of this alternative is therefore significantly different at a station as opposed to between stations.

**Station and Typical Sections**

As engineering design of the LRT system proceeds, detailed cross-sections will be developed for each different condition along the corridor. In order to provide an idea of how the system will be implemented in different locations, a series of six typical cross-sections were prepared. These typical cross-sections include the following:

- Center Running LRT - 400 South (Figure 4.2-1)
- Typical LRT Station Location - 400 South (Figure 4.2-2)
- Side Running LRT - 400 South (Figure 4.2-3)
- Center running LRT - North Temple (Figure 4.2-4)
- Typical LRT Station Location - North Temple (Figure 4.2-5)
- LRT in vicinity of SLCIA on north side of Interstate 80 (Figure 4.2-6)

Urban design features of LRT stations are discussed in 5.2.6 - Visual and Aesthetic Mitigation

**Potential Station Locations**

Potential LRT station locations are summarized below.

**Western Corridor Stations**

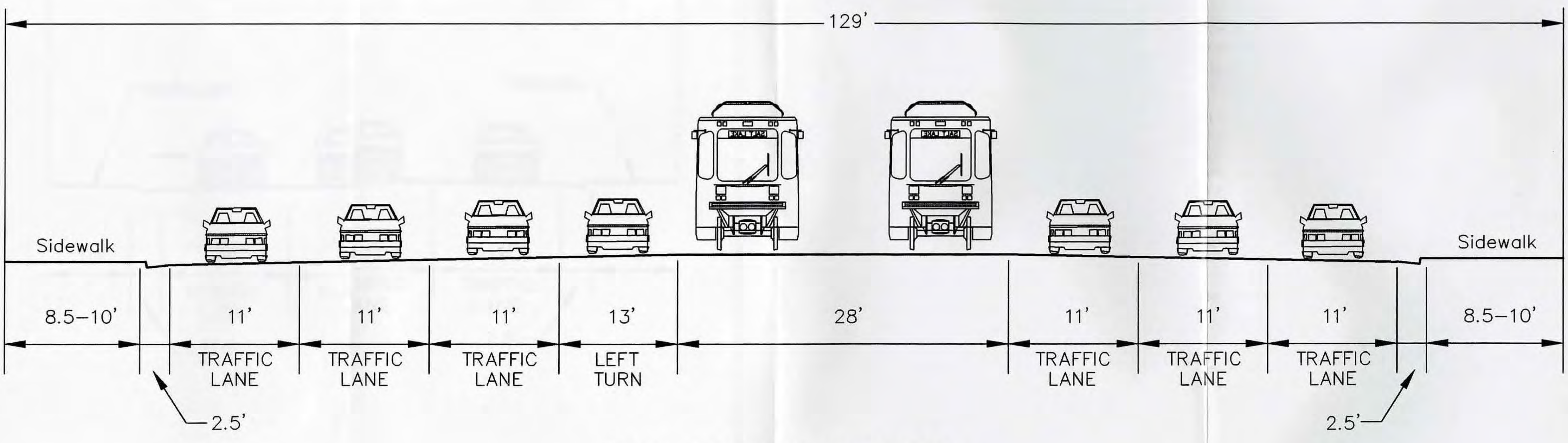
- Salt Lake Airport Terminal
- Winifred(1900 West)/North Temple
- Cornell(1550 West)/ North Temple
- Utah State Fairpark
- 800 West

**Downtown Stations**

- 400 West between South Temple and 100 South
- 400 West between 400 South and 300 South
- 400 South between 200 West and 300 West (**future**)
- 400 South between Main Street and West Temple

**Eastern Corridor Stations**

- 400 South between 200 East and 300 East
- 400 South between 600 East and 700 East
- 400 South between 800 East and 900 East
- Rice-Eccles Stadium
- Fine Arts Museum
- Huntsman Center
- University Health Sciences Center




400 SOUTH CENTER

UTA TRAX TRANSIT EXPRESS

WASATCH FRONT REGIONAL COUNCIL
420 West 1500 South, Suite 200
Bountiful, Utah 84010

PARSONS TRANSPORTATION GROUP
DE LEUW, CATHER & COMPANY
406 WEST SOUTH JORDAN PARKWAY, SUITE 300
SOUTH JORDAN, UTAH 84095 (801) 553-1944

**Typical Section**
**Center Running LRT-400 South**

**Figure 4.2-1**

Typical Section - Center Running LRT - 400 South

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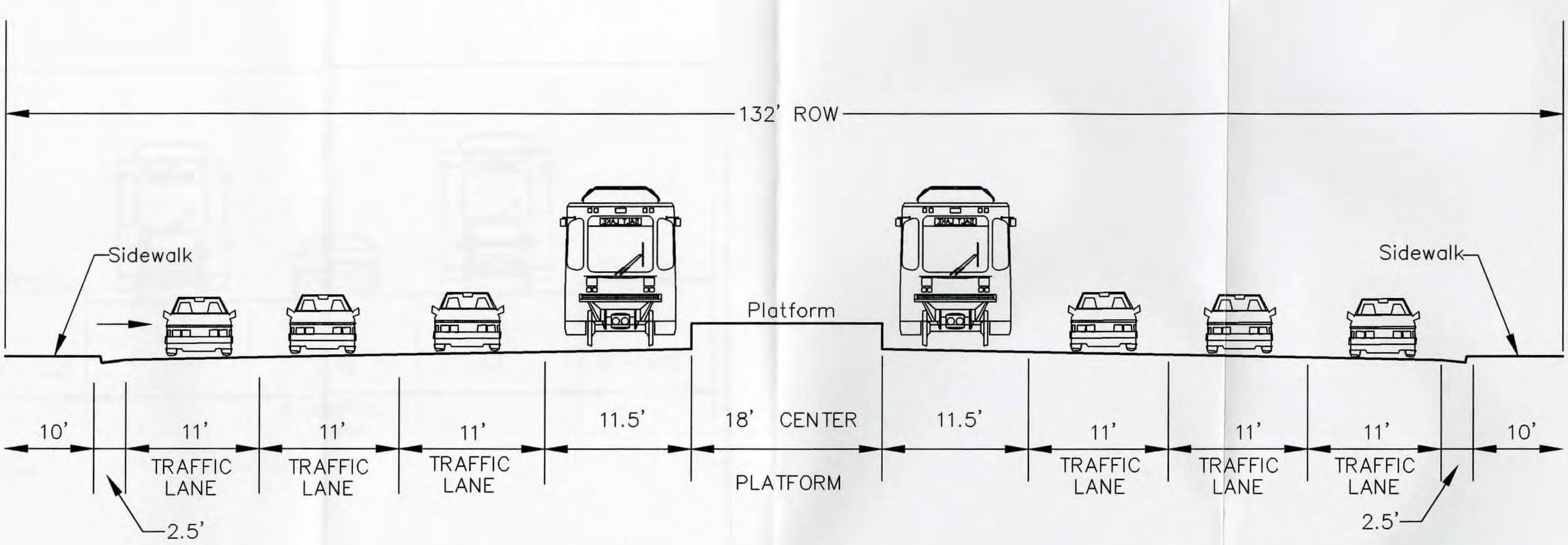


400 SOUTH CENTER W/PLATFORM

UTA TRAX TRANSIT EXPRESS

WASATCH FRONT REGIONAL COUNCIL
420 West 1500 South, Suite 200
Bountiful, Utah 84010

PARSONS TRANSPORTATION GROUP
DE LEUW, CATHER & COMPANY
406 WEST SOUTH JORDAN PARKWAY, SUITE 300
SOUTH JORDAN, UTAH 84095 (801) 553-1944

## Typical Station Cross Section - 400 South

Figure 4.2-2

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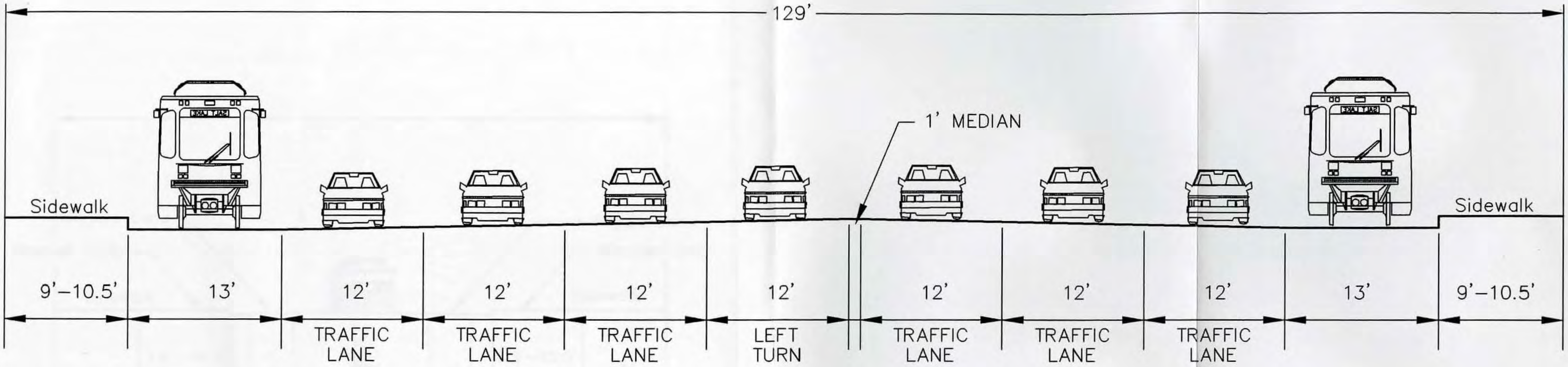


400 SOUTH SIDE RUNNING

UTA TRAX TRANSIT EXPRESS

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420 West 1500 South, Suite 200
Bountiful, Utah 84010

PARSONS TRANSPORTATION GROUP
DE LEUW, CATHER & COMPANY
406 WEST SOUTH JORDAN PARKWAY, SUITE 300
SOUTH JORDAN, UTAH 84095 (801) 555-1944

Typical Section
for Side Running LRT-400 South

Figure 4.2-3

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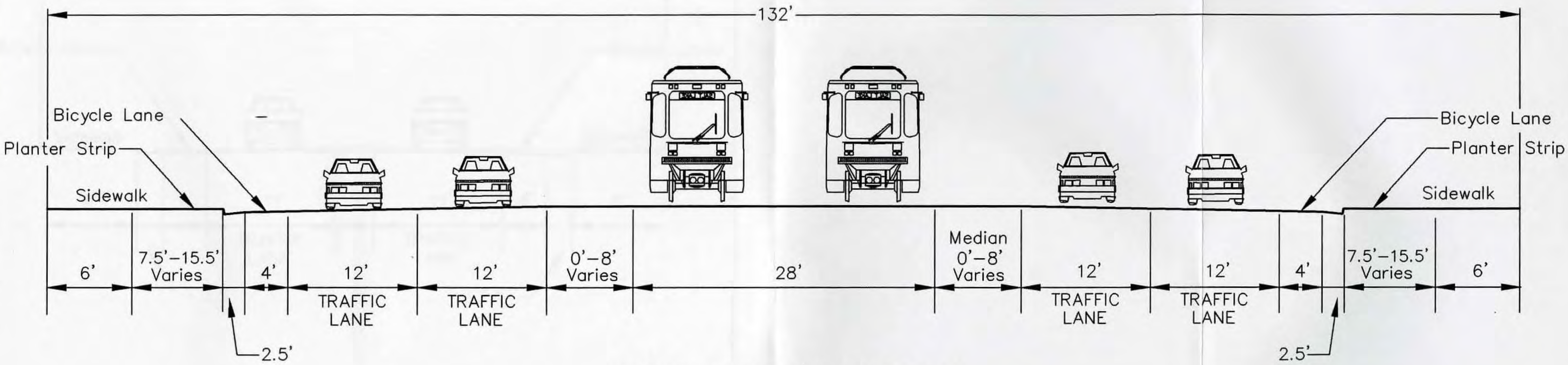


NORTH TEMPLE SECTION

UTA TRAX TRANSIT EXPRESS

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Bountiful, Utah 84010

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DE LEUW, CATHER & COMPANY
406 WEST SOUTH JORDAN PARKWAY, SUITE 300
SOUTH JORDAN, UTAH 84095 (801) 553-1944

Typical Cross Section for Center Running LRT North Temple

Figure 4.2-4

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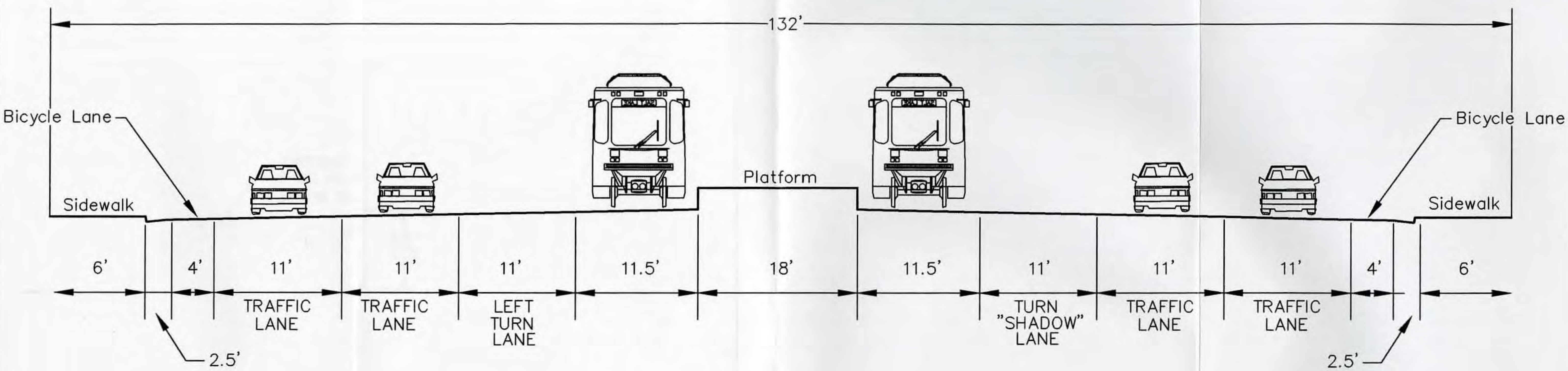


NORTH TEMPLE SECTION W/PLATFORM

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PARSONS TRANSPORTATION GROUP
DE LEUW, CATHER & COMPANY
406 WEST SOUTH JORDAN PARKWAY, SUITE 300
SOUTH JORDAN, UTAH 84095 (801) 553-1944

**Typical Station Cross Sections for North Temple**

Figure 4.2-5

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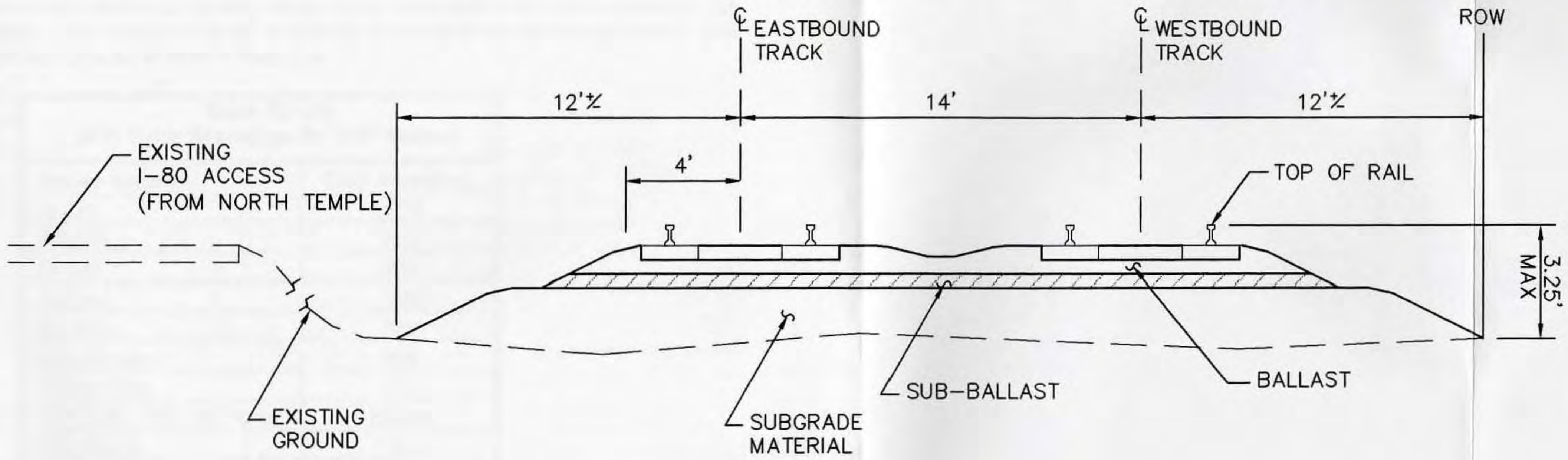


Looking West

WASATCH FRONT REGIONAL COUNCIL
420 West 1500 South, Suite 200
Bountiful, Utah 84010

PARSONS TRANSPORTATION GROUP
DE LEUW, CATHER & COMPANY
406 WEST SOUTH JORDAN PARKWAY, SUITE 300
SOUTH JORDAN, UTAH 84095 (801) 553-1944

## West-East Corridor FEIS
## Cross Section at I-80 Right-of-Way

Figure 4.2-6

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Full citizen participation and public involvement activities will be conducted throughout the design process for residential communities, businesses and other interests affected by LRT stations. These activities will be conducted by the UTA. Issues that will be addressed during the design phase will include:

- Mode of access at each station (e.g., walk, bicycle, drive, drop-off, transit);
- Specific bus route modifications and new bus routes required to serve each LRT station; and
- Traffic access circulation requirements, and mitigation required at station ingress and egress locations.

**Year 2020 Daily Station Boardings**

Table 4.2-15 shows the results of forecasting efforts which provide the number of daily boardings by LRT station. The numbers shown in this table should be considered as order-of-magnitude estimates. Travel demand forecasting models are generally not sensitive to micro-level (e.g. site specific locations) detail. Still, they provide an idea of the extent to which parking or bus or other transfer activity might be required at station locations.

**Table 4.2-15**
**2020 Daily Boardings By LRT Station**

| Station Name | Daily Boardings |
|---|---|
| SLCIA | 2,716 |
| Winifred | 459 |
| Cornell | 801 |
| Fairpark | 379 |
| 800 West | 848 |
| Delta Center | 589 |
| Pioneer Park | 919 |
| 400 South - 200 - 300 West | **Future** |
| Main Street | 2,924 |
| 200 East | 763 |
| 600 East | 1,112 |
| 900 East | 857 |
| Rice-Eccles Stadium | 1,921 |
| Fine Arts Museum | 1,286 |
| Huntsman Center | 499 |
| Health Sciences | 688 |
| *TOTAL ALL STATIONS* | **16,761** |

The forecast of daily boardings predicts a total of 16,761 daily boardings in the year 2020 for the West-East LRT line. As indicated in Table 4.2-15, the LRT station at SLCIA generates the second highest volume of transit passengers with 2,716 boardings each day. It should be remembered that all of the forecast ridership numbers are for an average day during the year. It is anticipated that the number of boardings at SLCIA may be higher during peak travel days throughout the year.

The Main Street LRT station is anticipated to accommodate the highest volume of transit passengers with 2,924 daily boardings. Most of this volume is generated by transit passengers transferring to and from the North-South LRT Line. This high volume of transfer passengers highlights the positive impact on overall transit ridership resulting from the interaction of the two LRT lines.

It is expected that the four LRT stations located on the University of Utah campus will accommodate a total of 4,394 boardings on a typical day of the year. The actual number of passengers passing through each of the four stations is hard to predict precisely. The number will, of course, be considerably higher when major events occur at Rice-Eccles Stadium or at the Huntsman Center. A major event at Rice-Eccles Stadium, for example, could attract as many as 15,000 participants arriving via the LRT system.

Plans for pedestrian access to the Fine Arts Museum Station at the University of Utah include a connection across 500 South to the large existing parking area and other major trip generators such as the Veterans Hospital. Potential ridership to this station will therefore not be limited to those going to and from the University. This location will be a major interface point for buses serving southeast Salt Lake City, as well as passengers arriving from this same area by automobile.

**LRT Station Parking Needs**

The WFRC modeling data show that only two areas should be considered for park and ride locations at this time. The first area is in the vicinity of the Utah State Fairgrounds and has been identified as "Fairpark" in the above table. This location has been identified as an excellent site for peripheral parking in relation to downtown Salt Lake City. During major events or periods of high downtown congestion, travelers would be encouraged to park at this location and ride LRT into downtown rather than driving into downtown and finding a place to park. It appears that, as a conservative estimate, approximately 200 park and ride lot spaces at the Fairpark location will be required to be in place on opening day of the West-East LRT system.

The second area is at the University of Utah near the Fine Arts Museum Station. An order of magnitude estimate for parking spaces at this park and ride facility is between 100 and 150 spaces. This park and ride lot/transit center would accommodate the parking needs of patrons primarily from the southeast areas of Salt Lake City. Coordination is taking place with University of Utah on this facility.

**LRT/Bus Transit Interface**

The intermodal transfer of passengers between transit bus and LRT is an essential feature of all stations along the West-East LRT line. Generally, bus/LRT transfers are handled in two ways, depending on the particular station:

1. <u>Curbside Transit Stops</u>: At most stations, existing bus routes (or routes slightly modified to pass near the stations) operate on the same street as LRT or along adjacent cross streets. These buses stop at or near the stations, using conventional curbside bus stops. Passengers use signalized intersection crosswalks to access the stations, which are located, in most cases, in street medians.

This approach is suitable for low to moderate bus/LRT transfer volumes and where multiple bus routes are not intended to meet at regularly scheduled intervals. The principal impacts may be somewhat more intensive bus operations and higher bus stop pedestrian volumes in the vicinity of LRT stations than prior to LRT.

2. <u>Off-Street Transit Centers</u>: At key stations, buses are routed off-street into "timed-transfer" (also termed "pulse point") bus stations, where passengers have the opportunity to access LRT as well as other bus routes scheduled to meet and exchange passengers at regularly scheduled intervals. Depending on location, these facilities may be augmented by "Park & Ride", "Kiss & Ride", or a wide variety of transit-related land uses.

   This approach is suitable for high bus/LRT transfer volumes, where multiple bus routes converge on LRT, and where bus to bus transfers are also a critical function. The principal impacts may be significantly intensified bus operations in the vicinity of LRT stations, increased local traffic volumes if Park & Ride and Kiss & Ride are included, and the impacts of acquiring and developing property for the off-street facilities.

Along the West-East Corridor, three sites are under consideration for potentially significant off-street bus transit and parking facilities. The following sections and diagrams describe the three sites at a conceptual level.

1. <u>Airport Station (Airport Landside Transportation Center)</u>: Under preliminary conceptual designs for the new terminal at Salt Lake City International Airport, the West-East LRT line terminates in an elevated stub-end station inside an extension of the terminal dedicated to ground transportation, from which passengers will walk a short distance to the main terminal concourse (see Figure 4.2-7). Although designs are not completed, it is likely that buses will stop at bays along the Arrival Level main roadway (or Departure Level roadway depending on future design refinements) directly below the LRT station, and connect to the LRT level with escalators, elevators, and stairs. Bus routes using the facility are indeterminate but would likely include UTA bus routes serving the existing terminal, airport shuttles serving remote parking lots and employee destinations, and a variety of private and dedicated buses such as those serving hotels, off-airport car rental facilities, and charters.

   The Landside Transportation Center may also serve over-the-road motor coach services such as Greyhound Lines and will therefore be designed to have this flexibility.

2. <u>State Fairpark Station (1000 West / North Temple)</u>: State Fairpark Station is located on North Temple immediately west of 1000 West. The site under consideration (see Figure 4.2-8) is vacant land owned by the State Fairpark Corporation located along the south side of North Temple directly opposite the Fairpark grounds. The site is being considered for a number of future uses by the Fairpark Corporation, and the Fairpark Master Plan includes a pedestrian bridge over North Temple linking the site to the Fairpark. The LRT station is being designed to allow a future direct connection to the bridge at the west end of the station.

   Transit uses of the site would take advantage of the direct Fairpark and LRT access and could include a major bus transfer facility, and/or a surface or structured Park & Ride facility. These uses could be developed jointly with other uses for the site proposed by the Fairpark Corporation, creating a high degree of development synergy.

Vehicular access to the site from North Temple would be provided by a new signalized intersection at the site's northwest corner where North Temple crosses the Jordan River. This same intersection also provides a safe crossing of North Temple for the Jordan River Parkway, a major regional recreational trail linking the Great Salt Lake with the Utah Valley. UDOT has recently installed a traffic signal at this intersection.

3. Fine Arts Museum Station: This station, serving the University of Utah campus, is located along South Campus Drive, near the intersection of Guardsman Way and 500 South (Foothill Boulevard). The new University Fine Arts Museum is under construction immediately north of the station site. This station is ideally situated to connect LRT with local and regional UTA bus routes serving the east side of the Salt Lake Valley, using the Foothill Corridor's direct link southward to I-80 and I-215. The concept is illustrated in Figure 4.2-9.

   There are several scenarios as to how LRT can interface with bus transit at this site:

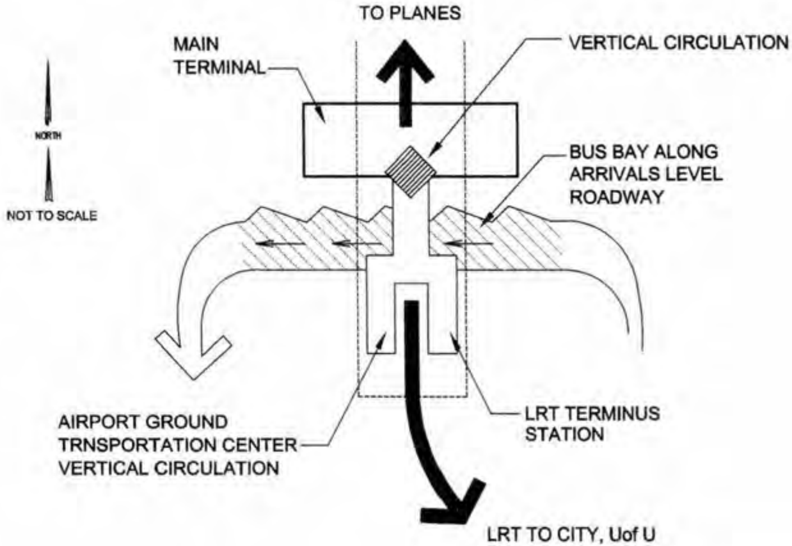
- University of Utah shuttle transit (buses or "people movers") operate along South Campus Drive along with LRT. Options under study include running buses in the LRT transitway interlined with trains or in the roadway alongside the transitway in mixed traffic. Under both options, shuttles can stop at the LRT station to exchange passengers.

- UTA buses currently operate on South Campus Drive. These buses could also interface with LRT in the same manner as the campus shuttles.

- UTA buses currently operate on 500 South (Foothill Blvd). These buses could stop at curbside within a short walking distance of the station on South Campus Drive. The existing signalized intersection at Foothill Boulevard and Guardsman Way will facilitate passengers crossing Foothill Boulevard to access eastbound buses along the south curb.

- The connection across Foothill Boulevard can be greatly enhanced by a new pedestrian bridge to the east of the Guardsman intersection. Favorable topography would allow a walkway from the LRT station to cross over the bridge and connect to the south side of Foothill Boulevard with a maximum gradient of about 2 percent, thus providing a convenient and fully accessible link between LRT and eastbound Foothill Boulevard buses.

- A site at the southeast corner of Foothill Boulevard and Guardsman Way, currently used as parking by the University of Utah, could be developed as a bus transit center and Park & Ride facility. As an off-street bus facility, the site would allow timed-transfers among multiple bus routes as well as an interface to LRT and Park & Ride. Joint-development of the site could combine transit uses with continued campus parking or other campus-related land uses. The potential pedestrian bridge across Foothill Boulevard would link the site directly to the Arts Museum LRT Station.

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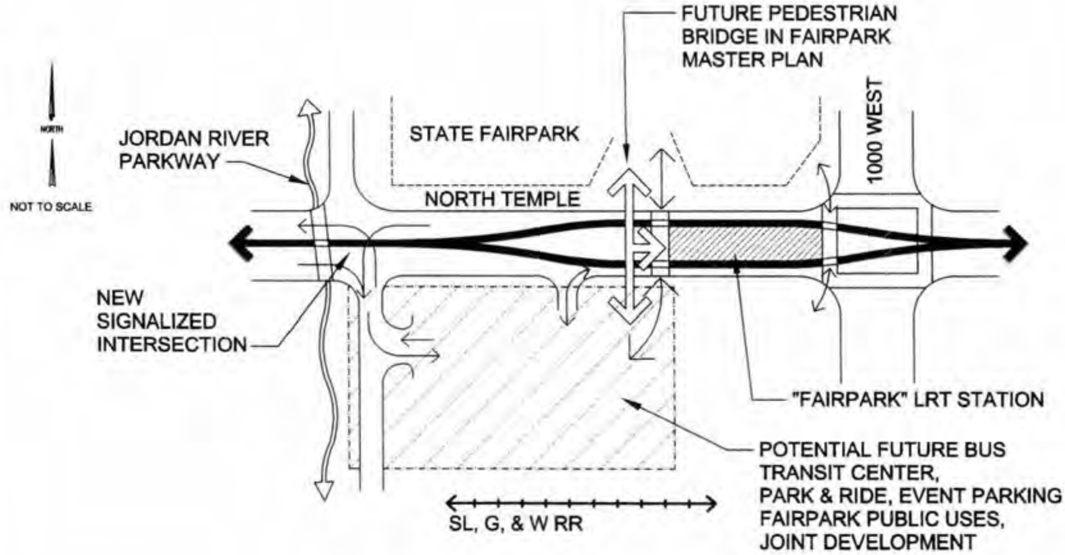
LRT/Bus Interface - SLC Airport

Figure 4.2-7

LRT/Bus Interface - SLC Airport

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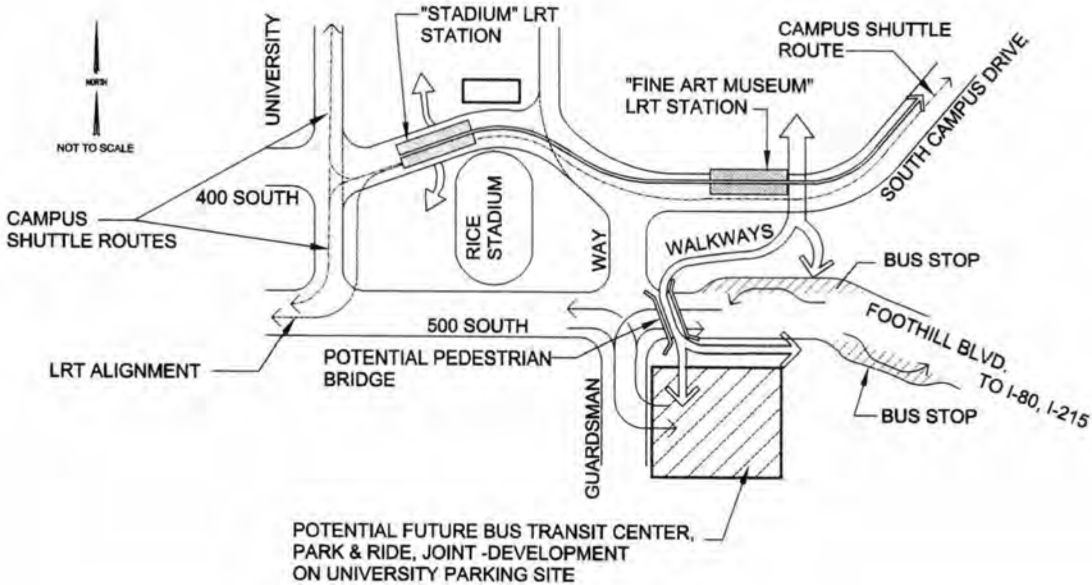
LRT/Bus Transit Interface
Utah State Fairpark

Figure 4.2-8

LRT/Bus Interface

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Fine Arts Museum Station Concept Plan

Figure 4.2-9

LRT/Bus Interface - Fine Arts Museum Station

The above scenarios can be viewed as alternatives or as a progressive development over time, leading to a fully featured eastside transportation center. Impacts of this center would include the visual presence of the pedestrian bridge over the Foothill Corridor (which could be transformed into a visual amenity if the bridge is designed with artistic care and imagination) and increased traffic movements at the Foothill Boulevard/Guardsman Way intersection. In addition, higher traffic volumes along Guardsman Way (caused by cut-though traffic to and from the south) could potentially impact residential areas to the south of Foothill Boulevard. However, these impacts could be mitigated completely through traffic calming and regulatory strategies applied to Guardsman Way immediately south of the transit center.

### 4.2.7 LRT Maintenance Facility and Storage

An LRT Maintenance and Storage facility is planned at 2400 West and North Temple. The proposed location and layout are shown in Figure 4.2-10. Capacity for at least 26 vehicles will be provided at this location. Future expansion may will allow for approximately 40 light rail vehicles at this location. This additional vehicle storage will accommodate future expansion of the system.

Discussions are underway with the Salt Lake City International Airport for possible joint use of this facility if they decide to use an LRT-type people mover system to shuttle passengers between the main terminal and the planned car rental facility. If the transit technology used for the shuttle system is similar to or compatible with the LRT vehicles, the maintenance and storage facility would be used to service transit vehicles for both operations.

## 4.3 STREET AND HIGHWAY IMPACTS

### 4.3.1 Additional Analysis Completed Since Issuance of the DEIS/MIS

Traffic impacts of several transit alternatives, including the LRT, were evaluated in the University of Utah to Airport Transportation Corridor MIS/DEIS. The DEIS concluded that the locally preferred alternative (LPA), LRT, should be located along the 400/500 South Corridor. The DEIS stated that additional analysis would be required, to further determine the impact of LRT on 400/500 South. In addition, during the comment period of the DEIS, comments were made requesting both the use of more refined traffic forecasts and the conduct of more detailed traffic operational analysis.

Since the completion of the DEIS, WFRC has completed additional MINUTP model runs of the corridor to reflect updated assumptions and more current information. These changes in assumptions include the Forecast Year of 2020 instead of 2015.

In order to respond to the DEIS comments, two technical subcommittees were established composed of members of UDOT Region 2, UDOT Planning, UDOT Traffic Planning Statistics Section, Salt Lake City Traffic Division and Wasatch Front Regional Council. One subcommittee considered traffic forecasting issues while the second subcommittee considered traffic operational issues. The culmination of the evaluation processes of both committees led to a report entitled, *400 South Traffic Analysis Report* (April 30, 1998). Additional analysis was performed on North Temple and the intersection of North Temple and Redwood Road. This report, including all analysis and conclusions, was concurred with by all technical agency staff.


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Conceptual Location & Design
for
LRT Maintenance Facility

Figure 4.2-10

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This section provides supplemental information regarding the refinement of traffic forecasts including a detailed review of WFRC's model projections and assumptions for the determination of peak hour traffic volumes along 400 South and 500 South. It also contains detailed traffic operational analysis of nine intersections along 400 South under 12 scenarios considering various geometric, operational and time-of-day parameters. The intersections included in the supplemental analyses include: 400 West, 300 West, 200 West, West Temple, Main Street, State Street, 200 East, 700 East, and 1300 East. Delay, level of service, and traffic progression were the most significant analyses conducted. For details concerning the above-referenced procedures, the reader should consult the *400 South Traffic Analysis Report* and its applicable appendix.

The analysis conducted through mid-July 1998 assumed that the LRT alignment would be placed in the center of the 400/500 South travelway. This assumption is no longer valid for the section of the alignment along 400 South between 400 West and 200 East. As a result of discussions with the Utah Department of Transportation, the decision has been made to place the LRT alignment in those blocks on the sides instead of in the center of the street. The concept provides for an 85-foot center section that would be available for through traffic and left turn lanes. A single light rail track would be placed on either side of this 85-foot center section. Because of this design change, additional analysis was undertaken to determine the traffic operational impacts of modifying the roadway geometry and lane usage in order to accommodate placement of a single track in each direction along 400 South between 400 West and 200 East.

## 4.3.2 Scenario Development and Assumptions

**Introduction**

Two traffic operations/geometric scenarios are presented based on the interim studies completed subsequent to the distribution of the MIS/DEIS document. Based on the analysis included in the *400 South Traffic Analysis Report*, the PM peak hour was shown to operate at reduced levels of service. Therefore, the PM peak hour was selected to be a "constant" in order to show worst-case conditions for the No-Build and Build scenarios. Two additional constants have been assumed for the traffic operations scenarios analyzed: Without 100 South HOV lanes; and Optimized Geometry. These parameters are described below.

- Without 100 South HOV Lanes. Implementation of HOV Ramps from north I-15 to 100 South would result in a reduction of 300 to 1,000 vehicles in the peak hour. Currently, UDOT is negotiating with the design/build contractor for the I-15 reconstruction to add the 100 South HOV lanes to their contract. If these negotiations are successful, these HOV ramps could be in place as early as 2001. If UDOT decides not to include this element in the current contract, these ramps would be constructed in the future, say by 2020. Scenarios A and B assume that 100 South HOV lanes *will not* be in place.

- Optimized Geometry. Where feasible, double left turns, addition of right turn lanes, lengthened left turn pockets or right turn lanes will eventually be constructed. These improvements have been incorporated into the lane usage and traffic control assumptions shown in Figures 4.3-1 and 4.3-2 for the No-Build and Build conditions, respectively.

For the purpose of this analysis, Scenarios A and B were defined as follows:

- Scenario A: (NO-BUILD) Without LRT: PM Peak Hour, Without 100 South HOV Lanes and Optimized Geometry[2]

[2] This scenario was analyzed as Scenario 4 in the *400 South Traffic Analysis Report*, April 30, 1998, prepared by De Leuw, Cather & Company.

- Scenario B: With LRT: PM Peak Hour, Without 100 South HOV Lanes, and Optimized Geometry[3]

**2020 PM Peak Hour Turning Movement Volumes**
Year 2020 PM peak hour traffic turning movement volumes under conditions without LRT (Scenario A) and with LRT (Scenario B) are shown on Figure 4.3-1 and Figure 4.3-2, respectively. The trafic volumes under conditions assuming the implementation of LRT assume a five percent reduction for all movements east of State Street, and a two percent reduction for all movements west of State Street. This reduction takes into account the fact that some auto-drivers will switch modes and opt to take LRT when it is operational. These volume reductions were approved by WFRC.

**Assumptions for No-Build and Build Scenarios**
Table 4.3-1 shows the geometric and operational assumptions set forth for Scenario A - No-Build and Scenario B - Build. The lane usage and traffic control assumed for Scenario A - No-Build and Scenario B - Build conditions are shown in Figures 4.3-3 and 4.3-4, respectively.

The typical section for the center-running LRT and side-running LRT segments are shown in Figures 4.2-2 and 4.2-4, respectively. The side-running (a single line on each side of the travelway) LRT will run on 400 South between 400 West and 300 East.

Additional assumptions related to the Build condition are as follows:

- Operations and station configurations will be the same as in the North South LRT, where possible;

- Station may be located at the far side of the intersection, going the direction of the light rail, to accommodate left turns;

- Left turns of vehicles, where vehicles will be crossing the Light Rail tracks, will require a separate left turn phase;

- Due to construction of the track connections at 400 South and Main Street, left turns will be prohibited.

**North Temple**
Initially, a limited analysis was performed on North Temple, SR-186, from 400 West to 2200 West. The rationale of the traffic subcommittees was that if 400 South, the higher traffic volume road would operate at an acceptable LOS, North Temple would work as well. Additional analysis was performed for the purpose of completeness.

North Temple functions as an arterial with access to local business. When UDOT designed I-80, North Temple was dead ended at 2200 West. Before I-80, North Temple was the primary route to the airport and Wendover, Nevada. The intent of the North Temple closure was to divert through traffic to I-80 and keep North Temple a local access route. I-80 is projected to have excess capacity, into the year 2020, thus keeping North Temple as a primarily local access road.

North Temple is currently striped with three through lanes eastbound and westbound, because it is a detour route for the I-80/I-15 interchange, currently under construction. The plan is to return North Temple to two lanes eastbound and two lanes westbound.

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[3]This scenario was analyzed as Scenario 3 in the *400 South Traffic Analysis Report*, April 30, 1998, prepared by De Leuw, Cather & Company.

Assumptions made for the analysis of North Temple are as follows:

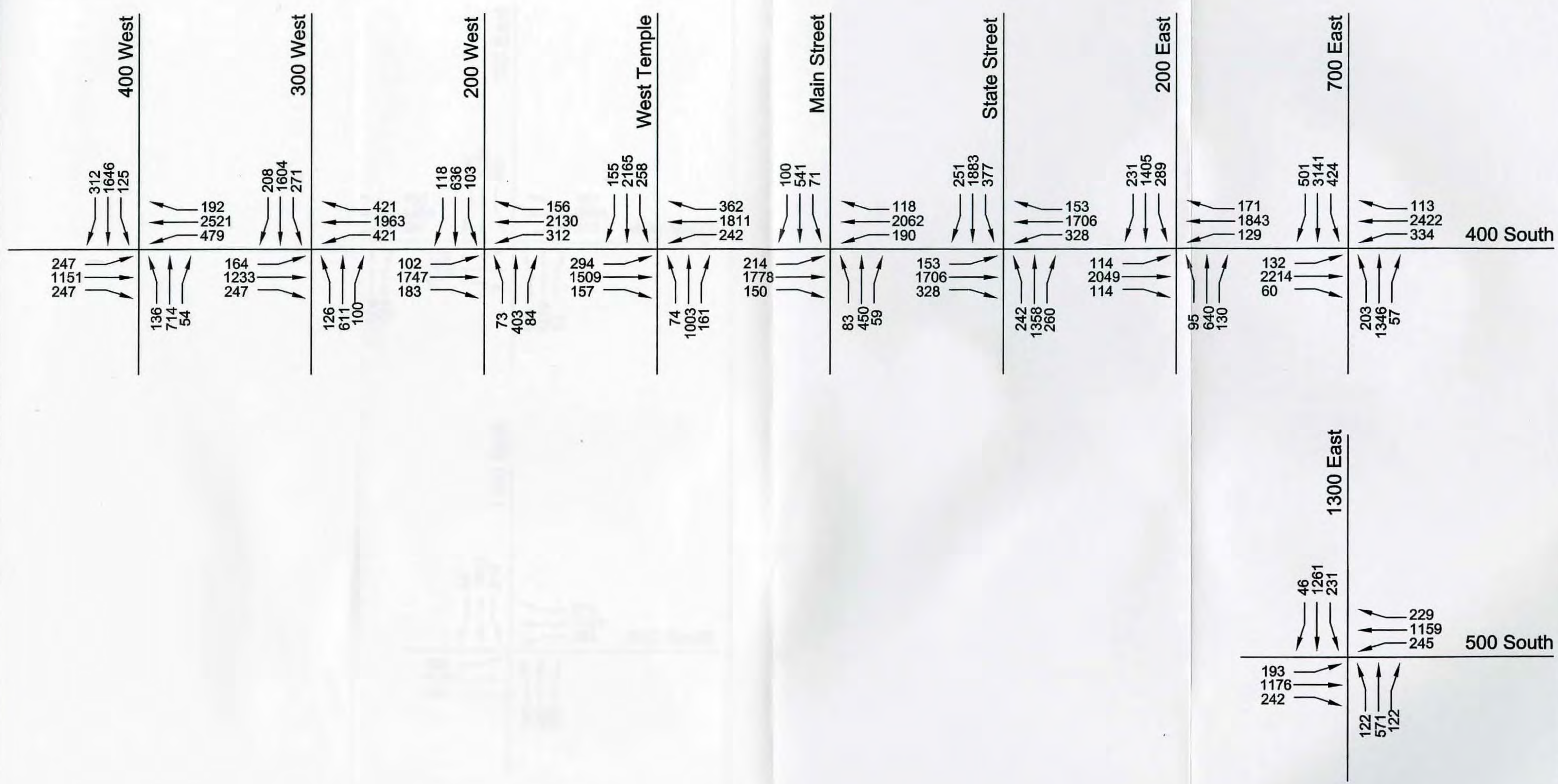
Lane configuration: Two lanes per direction
2020 ADT: 40,000 vehicles per day
growth: four percent per year from 1996 traffic

One or two signalized intersections are under consideration between Redwood Road and the Jordan River. Possible locations include Navajo Street, Cornell Street and direct access to the Menlove Recreational Vehicle Complex at approximately 1460 West. A cursory analysis indicates that this signal(s) would function at an acceptable level of service and would not have a significant impact on the overall operation of North Temple.

In summary, LRT on North Temple will not have significant impact, with the exception of the intersection at Redwood Road, which is further evaluated in Section 4.3.3.

**Table 4.3-1**
**Geometric and Operational Assumptions For Scenarios A and B**

| | Scenario A No-Build | Scenario B Build (With LRT) |
|---|---|---|
| Parameters | | |
| With 100 South HOV Lanes | NO | NO |
| Optimized Geometry | YES | YES |
| PM Peak Hour | YES | YES |
| Signal Cycle Length | 90-second | 90+ seconds |
| Signal Actuation | YES | YES |
| Green Split/Timing | optimized | optimized |
| Right Turn On Red | Yes | No |
| Permitted Left Turns | At 400 West, 200 West, West Temple, Main Street and 200 East | No |
| Protected/Permitted Left Turn Phases | 300 West, State Street | 700 East, 1300 East |
| Protected Left Turns | Where warranted by traffic volumes. | For all intersections where dual left turns are provided. 300 West, 200 West, West Temple, State Street, 200 East |
| Lane Geometry and Traffic Control | See Figure 4.3-1. Note: Existing Conditions assumed east of 300 West. Construction plans from I-15 reconstruction were used to determine geometrics west of 300 West. | See Figure 4.3-2. |
| Buses | 12 per hour during peak period on 400 South | LRT will replace eight of 12 buses per hour currently operating on 400 South. |
| Parking | Allowed on 400 South and most cross streets | Prohibited |
| Signal Pre-emption | n/a | No "hard" traffic signal pre-emption for light rail. LRT will have a secondary priority, extending the through phase for the light rail and skipping non LRT phases where possible. |

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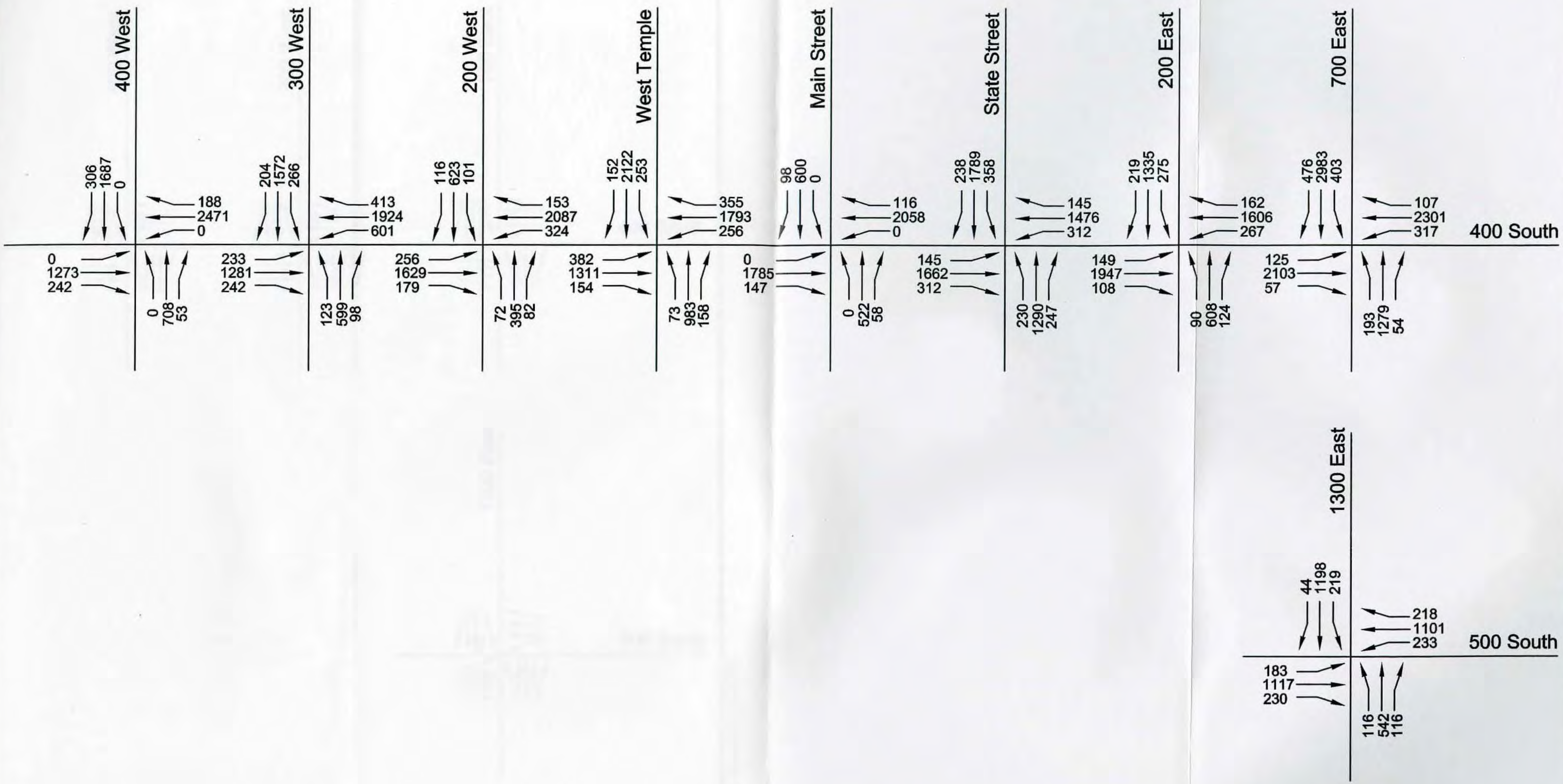
Scenario A (Without LRT)
Year 2020 PM Peak Hour
Turning Movement Volumes

Figure 4.3-1

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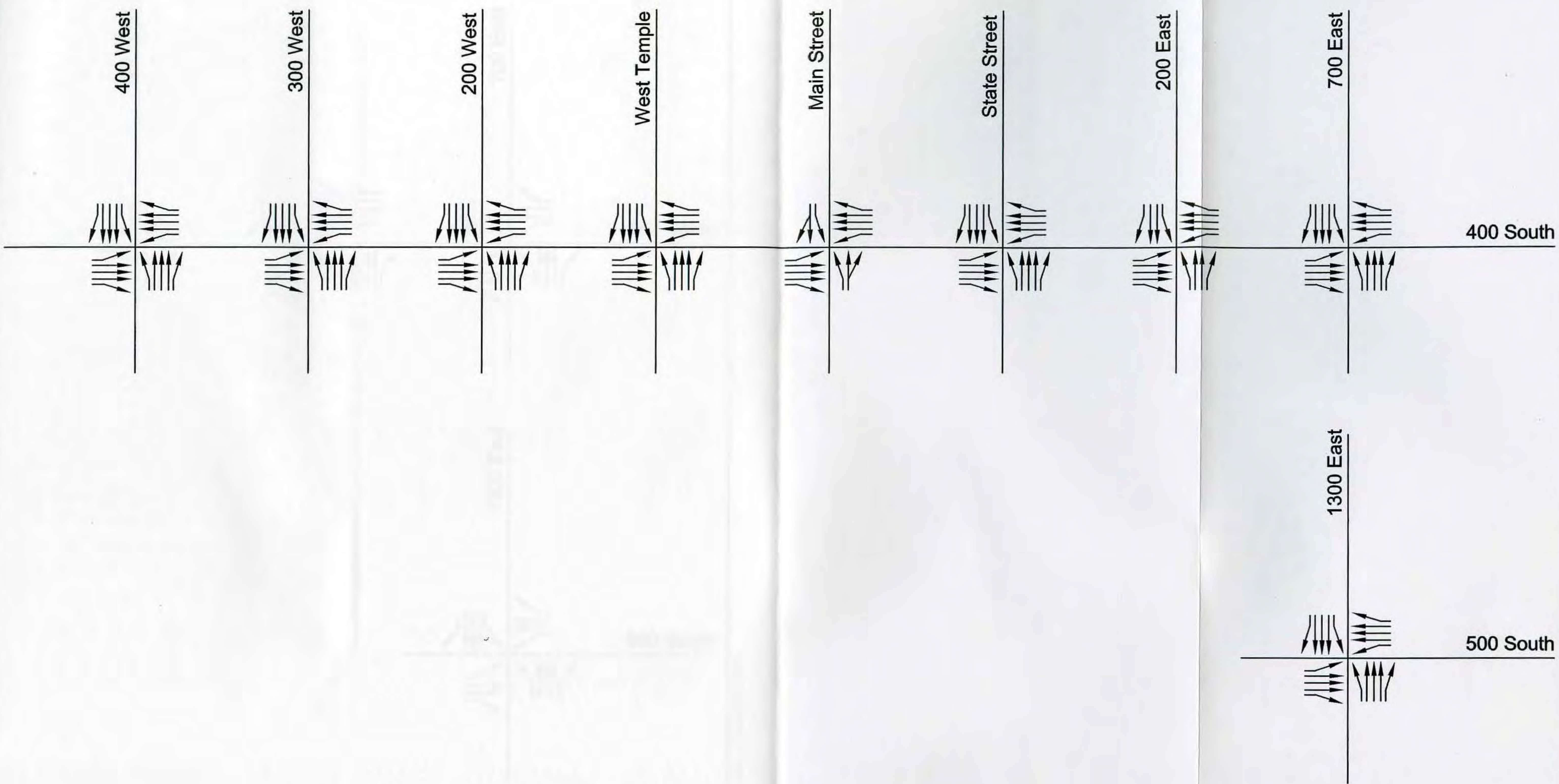
Scenario B (With LRT)
Year 2020 PM Peak Hour
Turning Movement Volumes

Figure 4.3-2

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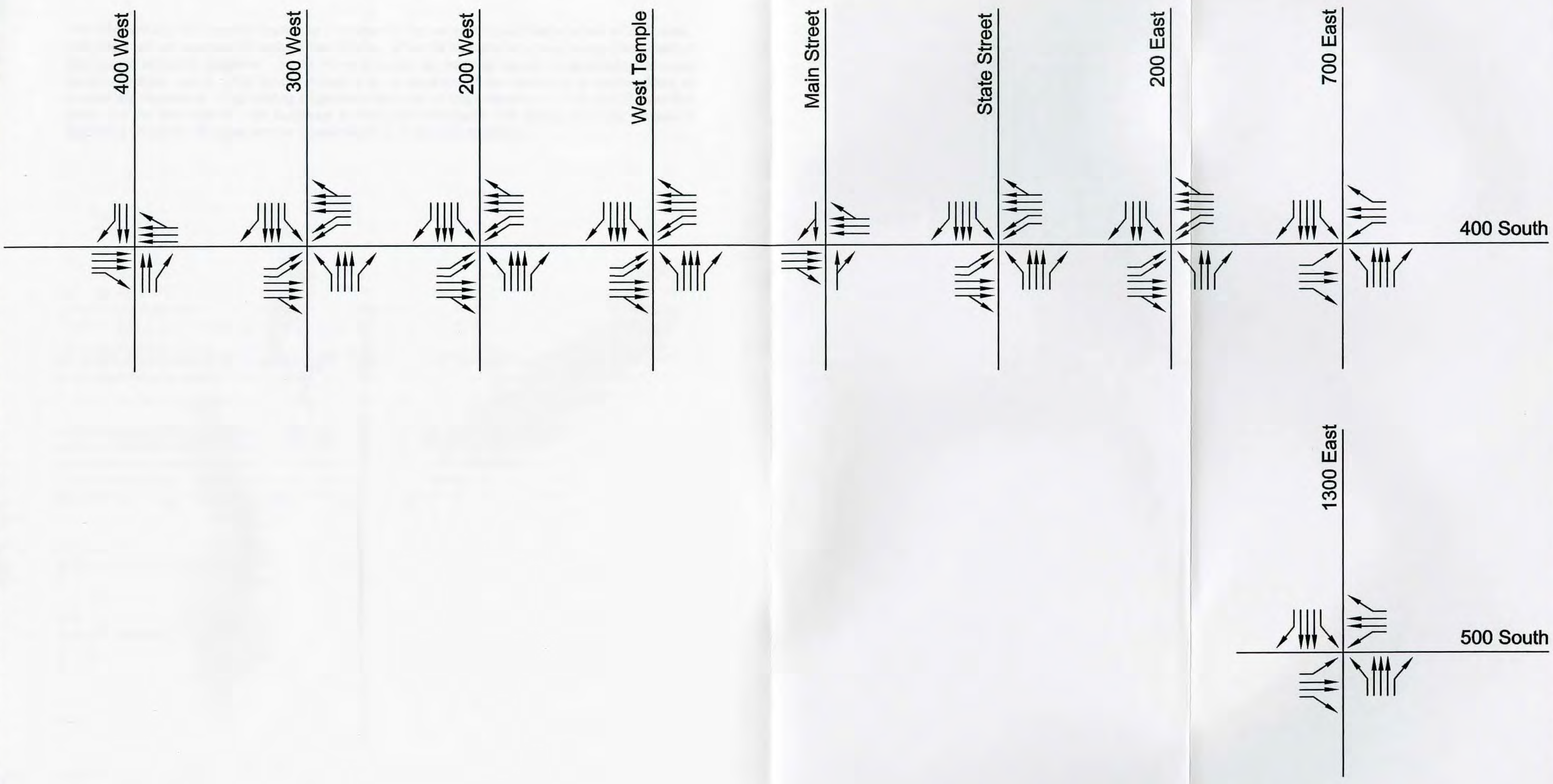
Lane Usage & Traffic Control
Under Scenario A -
No Build

Figure 4.3-3

Lane Usage & Traffic Control - Scenario A (No-Build)

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Lane Usage & Traffic Control Under Scenario B - Build

Figure 4.3-4

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The side-running LRT system increases the potential for auto/LRT conflicts and risk of accidents. Mitigation will be required to reduce the number of conflict points which will have the effect of decreasing accident potential. Table 4.4-4 provides an address and/or a description of each access location along 400 South including an evaluation of the potential to either close or consolidate driveways. Engineering judgment was used in this evaluation. UTA, UDOT and Salt Lake City, in association with business owners and residents, will make any final decisions regarding driveway closures and/or consolidations at specific locations.

### 4.3.3 Intersection Analysis Results

Tables 4.3-2 and 4.3-3 provide the results of the level of service analysis for Scenarios A and B. Intersection level of service is analyzed by traffic movement and for the intersection as a whole. Level of service ranges from LOS "A" which represents free flow conditions to LOS "F" which represents stop and go traffic where average delays exceed 60 seconds per vehicle. From a level of service standpoint, when a "failed movement" is indicated, it means that a vehicle may expect a stopped delay of 60 seconds or greater.

As shown, Scenario A exhibits 13 failed left turns as compared to 14 failed left turns for Scenario B. The number of failed through movements for Scenario A is 19 and for Scenario B is 16. Of the 10 intersections considered in Scenario A, a total of 120 traffic movements are permitted (12 possible movements at 10 intersections). Of this number, 75 operate at level of service "D" or better (which represents 70 percent of the total).

Scenario B, with LRT, contains 112 permitted traffic movements for the 10 intersections under study. This means that 8 traffic movements will not be permitted under the Build scenario (left turns at 400 West and Main Street). Fifty-two (52) of the 112 traffic permitted traffic movements will operate at LOS "D" or better (which represents 46 percent of the total).

The presence of LRT on 400 South (Scenario B) requires a dedicated left turn phase on 400 South (no permissive left turns). This requires more greentime for left turning movements which diminishes through capacity.

Growth in traffic volumes over time will continue to increase traffic congestion throughout the corridor. Even without the implementation of LRT, several intersections such as 400 South at State Street, 700 East at 1300 East, and North Temple at Redwood Road, will experience significant operational problems. The LRT system will divert some auto trips to transit, thus reducing future traffic volumes. However, the need for separate signal phases for LRT turning movements will slightly reduce the LOS at some intersections.

Under the Build scenario, the most impacted intersections within the 400 South corridor are: 700 East/400 South (which has nine of 12 movements failing) and State Street/400 South and 1300 East/500 South (both of which have seven of 12 movements failing).

Under the No-Build scenario, the most impacted intersections within the 400 South corridor are 700 East/400 South (which has seven of 12 movements failing), and Redwood Road/North Temple (which has five of 12 movements failing).

**Table 4.3-2**
**Scenario A: 2020 WITHOUT LRT: PM Peak Hour, Without 100 South HOV Lanes and Optimized Geometry[4]**

| Intersection | | LEVEL OF SERVICE | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | East Approach | | | West Approach | | | North Approach | | | South Approach | | | Intersection Overall |
| | | L | T | R | L | T | R | L | T | R | L | T | R | |
| 400 W/400 S | LOS | F | * | B | E | C | B | C | * | B | D | C | B | F |
| 300 W/400 S | LOS | E | F | B | D | E | B | D | F | B | C | C | B | F |
| 200 W/400 S | LOS | D | C | B | B | C | B | C | C | B | D | B | B | C+ |
| W Temple/ 400 S | LOS | C | * | B | E | E | B | D | F | A | F | D | B | F |
| Main Street/ 400 S | LOS | C | F | B | C | D | B | F | E | E | F | C | C | E+ |
| State Street/ 400 S | LOS | E | E | B | D | * | B | F | * | B | E | * | B | F |
| 200 E/ 400 S | LOS | C | F | B | C | * | B | D | F | B | C | C | B | F |
| 700 E/ 400 S | LOS | F | * | B | F | * | C | * | * | C | F | D | B | F |
| 1300 E/ 500 S | LOS | D | F | B | D | F | B | D | E | B | C | C | B | E |
| Redwood Rd/N Temple[5] | LOS | F | F | D+ | F | D+ | C+ | F | E+ | n/a | F | B | B | E |

*= volume-to-capacity ratio is above 1.2; results are not meaningful based on Highway Capacity Manual Methodology
n/a= movement not applicable for intersection

**Table 4.3-3**
**Scenario B: With LRT: PM Peak Hour, Without 100 South HOV Lanes, and Optimized Geometry**

| Intersection | | LEVEL OF SERVICE | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | East Approach | | | West Approach | | | North Approach | | | South Approach | | | Intersection Overall |
| | | L | T | R | L | T | R | L | T | R | L | T | R | |
| 400 W/400 S | LOS | n/a | F | F | n/a | C+ | C+ | n/a | D | B | n/a | F | D+ | F |
| 300 W/400 S | LOS | F | F | F | F | E | E | D+ | F | B | D+ | C | B | F |
| 200 W/400 S | LOS | E | E | E | D+ | C+ | C+ | C+ | C+ | B+ | D | B | B+ | D |
| W Temple/ 400 S | LOS | D | F | F | F | C+ | C+ | D | F | B+ | F | E+ | B | F |
| Main Street/ 400 S | LOS | n/a | E+ | E+ | n/a | C+ | C+ | n/a | E+ | E | n/a | C+ | C+ | D+ |
| State Street/ 400 S | LOS | F | F | F | E+ | F | F | F | E+ | C+ | E | F | E | F |
| 200 E/ 400 S | LOS | F | E | D | D+ | F | F | D | E+ | B+ | F | C | B | F |
| 700 E/ 400 S | LOS | F | F | F | F | F | F | F | F | C | F | D+ | B | F |
| 1300 E/ 500 S | LOS | F | F | F | F | F | F | D+ | F | B+ | C | C | B+ | F |
| Redwood Rd/N Temple | LOS | C | E | B+ | C+ | E | B+ | C+ | E | E | C+ | C | C | E+ |

*= volume-to-capacity ratio is above 1.2; results are not meaningful based on Highway Capacity Manual Methodology
N/a= intersection movement not permitted

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4 Results from Table 2-6 on page 26 of the 400 South Traffic Analysis Report, De Leuw, Cather & Company, April 30, 1998

5 Additional analysis by De Leuw, Cather and Company

### 4.3.4 Traffic Impact Conclusions

Based on analysis presented above, the impact of the LRT Alternative on 400 South traffic operations will be minimal on through traffic and of minor significance on left turning traffic. Using the assumed 2020 traffic projections, many traffic movements are over-capacity on 400 South both with and without light rail. There are 11 traffic movements which in the No-Build condition which have volume-to-capacity ratios above 1.2 (shown as a * on Table 4.3-2) as compared with no traffic movements under the Build condition with a v/c ratio above 1.2.

The following mitigation measures could be considered in the future to minimize the impact of the project:

1. Implementation of a 100 South HOV lane will significantly alleviate the left turn and capacity problems on 400 South;

2. Salt Lake City currently operates most of 400 South on a 78 second signal cycle length which is the optimum cycle length for the block spacings of 800 feet and vehicle speeds of approximately 30 to 35 mph. When the LRT is introduced on 400 South it will be necessary to provide protected left turn phasing which will require an increase in signal cycle length.

3. Potential automobile capacity is lost with LRT by eliminating the potential of restriping streets to four lanes in each direction. With the exception of State Street and West Temple, most intersections would improve significantly by the addition of an extra lane;

4. It is anticipated that some intersection widening may be needed to accommodate intersections with LRT stations. This will not increase pedestrian walking times because pedestrians need only walk to the station platform area in the center of the street on one signal phase. They will not need to cross the entire street in one signal phase;

5. With projected LRT train headways of ten minutes the LRT operation will have limited impact on traffic operations. LRT operations will not affect more than one out of every six signal cycles in each direction. This appears to be the experience of the various cities contacted that have Light Rail Transit systems operating on city arterials;

6. Impacts of the LRT location and operation on 400 South can be mitigated by adjusting signal phasing to separate LRT and non-LRT phases along with configuring stations to allow left turns and widening intersections for both west/east and north/south traffic. Coordinating the speed of the trains with the traffic signal timing is also an important mitigation measure. These conclusions are confirmed by the experience of other cities with light rail running with traffic on high capacity roadways.

## 4.4 ON-STREET PARKING AND DRIVEWAY ACCESS

### 4.4.1 On-Street Parking - Redwood Road to 1300 East

A physical observation was performed in early August 1998 to determine the number of existing parking stalls available on both the main and side streets. Parking stalls for the side streets were obtained by inventory of one block sections to the north and south of the main LRT corridor. From this observation, the area between 1300 East and Redwood Road had the following parking stalls available:

Side Streets
- Metered Stalls - 272 total
- Non-Metered Stalls - 1299 total

Main Streets
- Metered Stalls - 118 total
- Non-Metered - 553 total

Based on this information, currently 70 percent of the available parking is on the side streets.

The parking stall occupancy rates for each of the three peak hours were observed during the following time periods:

- AM 7:00 AM to 9:00 AM
- Noon 11:00 AM to 1:00 PM
- PM 4:00 PM to 6:00 PM

Each peak hour was tallied to determine the percentage occupied. The number of stalls occupied with the corresponding percentages are contained in Table 4.4-1.

**Table 4.4-1**
**Peak Hour Occupancy Rate**

| **Side Streets** | **AM Peak** | **Noon Peak** | **PM Peak** |
|---|---|---|---|
| Stalls Occupied | 438 | 612 | 478 |
| Occupancy Rate | 28% | 39% | 30% |
| **Main Streets** | **AM Peak** | **Noon Peak** | **PM Peak** |
| Stalls Occupied | 94 | 248 | 161 |
| Occupancy Rate | 14% | 37% | 24% |

Typically, the noon peak appeared to be the busiest time period. However, there were still over 60 percent of the parking stalls vacant. If all the main street parking was removed there would be a total of 1,571 stalls to be used during any of the three peak hours. Based on the survey, the number of stalls which would be occupied on the side streets with the main street parking removed is summarized in Table 4.4-2.

**Table 4.4-2**
**Side Streets Occupancy with Main Streets Parking Removed**

| **Side Streets** | **AM Peak** | **Noon Peak** | **PM Peak** |
|---|---|---|---|
| Stalls Occupied | 532 | 860 | 639 |
| Occupancy Rate | 34% | 55% | 41% |

As Table 4.4-2 shows, the main LRT corridor parking can be removed and still only have a little more than half of the side street parking stalls occupied.

### 4.4.2 On-Street Parking and Driveway Access - 400 West to 200 East

The portion of the West-East LRT alignment on 400 South between 400 West and 1300 East will require the elimination of approximately 517 on-street parking spaces. Table 4.4-3 shows the number of on- and off-street spaces to be eliminated, by LRT segment. These parking spaces serve approximately 120 buildings inclusive of office, commercial and residential uses. Appendix H provides a tabular listing of all buildings along the 400 South LRT alignment plus an inventory of adjacent private off-street and on-street parking spaces. Due to the requirement to provide space within the right-of-way for the light rail vehicles and stations while preserving sufficient vehicular capacity on 400 South (by retaining the ability to construct dual left turn lanes at intersections when needed), the eventual removal of on-street parking spaces along 400 South is likely. Under the No-Build Alternative, parking could also be removed in the future to increase vehicular capacity.

Current users of on-street spaces on 400 South from 400 West to 1300 East will be requiredto park in proximate off-street parking lots or garages. Table 4.4-3 shows a summary of the off-street parking inventory conducted in the project vicinity. As shown, 4,875 spaces were counted in the corridor. This estimate should be viewed as conservative since a number of facilities are not included in the inventory (such as parking spaces for the City/County building and the Court House. Customers or patrons of businesses will be able to use available off-street parking locations in the vicinity of their destinations.

**Table 4.4-3**
**Summary of Parking and Building Inventory: 400 South Between 400 West and 1300 East**

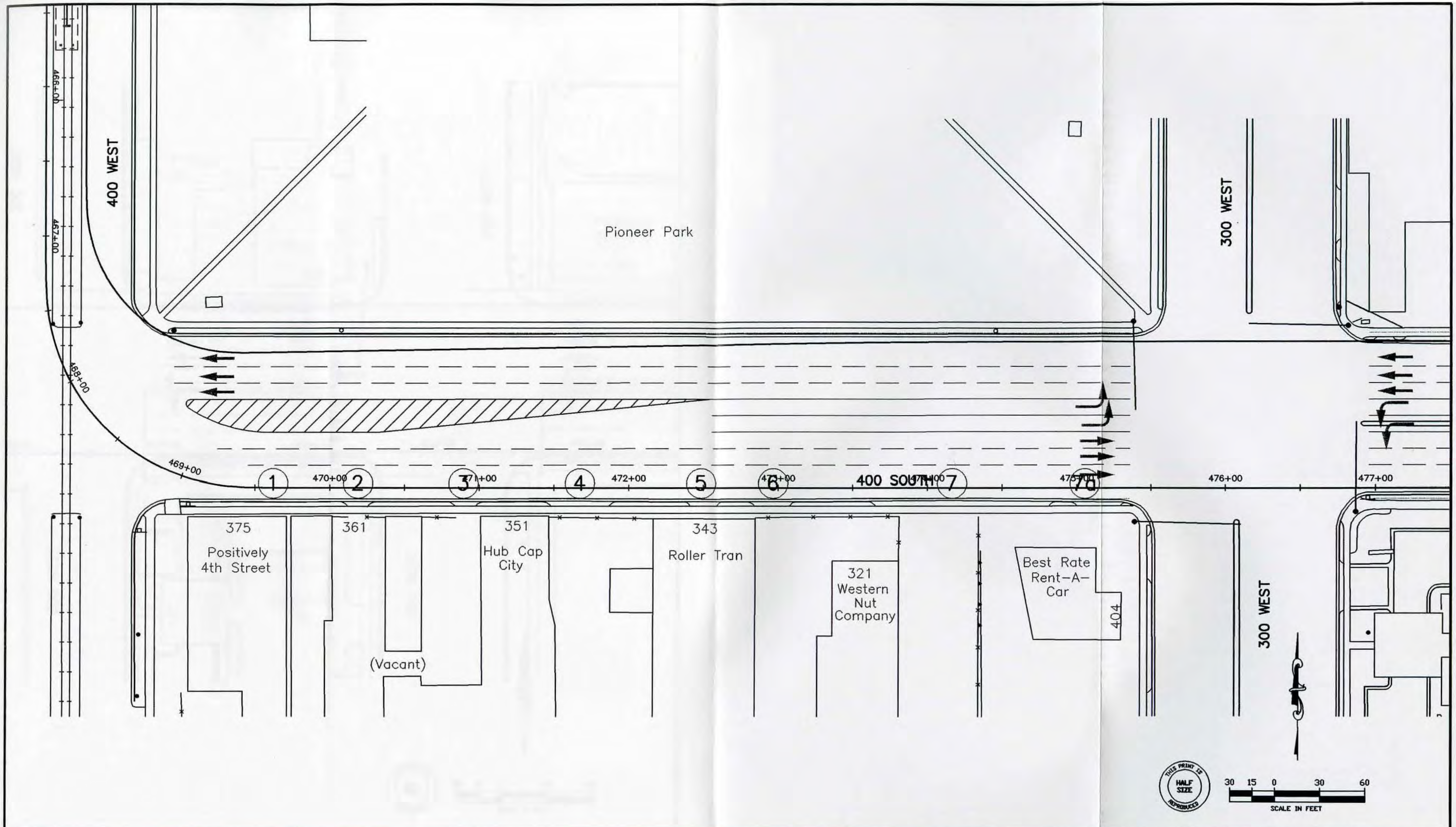
| *LRT Section* | Number of Buildings | Off-Street Parking | On-Street Parking (to be eliminated) |
|---|---|---|---|
| 400 West to West Temple | 28 | 715 | 83 |
| West Temple to Main | 5 | 180 | 12 |
| Main to 200 East | 11 | 1,512 | 61 |
| 200 East to 400 East | 17 | 646 | 71 |
| 400 East to 600 East | 17 | 485 | 66 |
| 600 East to 800 East | 17 | 739 | 51 |
| 800 East to 1300 East | 25 | 598 | 173 |
| **TOTAL** | **120** | **4,875*** | **517** |

*Off-Street parking totals do not include surface lots/garages for the City/County building and the Court House.

### 4.4.3 Driveway Impacts Along 400 South

Along 400 South, between 400 West and 200 East, there are 50 driveways serving various businesses, office buildings, governmental and other uses. The following figures show each of the driveways in the context of the side-running LRT system along 400 South from 400 West to 200 East:

Figure 4.4-1: Driveway Impacts Along 400 South between 400 West and 300 West
Figure 4.4-2: Driveway Impacts Along 400 South between 300 West and 200 West
Figure 4.4-3: Driveway Impacts Along 400 South between 200 West and West Temple
Figure 4.4-4: Driveway Impacts Along 400 South between West Temple and Main Street
Figure 4.4-5: Driveway Impacts Along 400 South between Main Street and State Street
Figure 4.4-6: Driveway Impacts Along 400 South between State Street and 200 East

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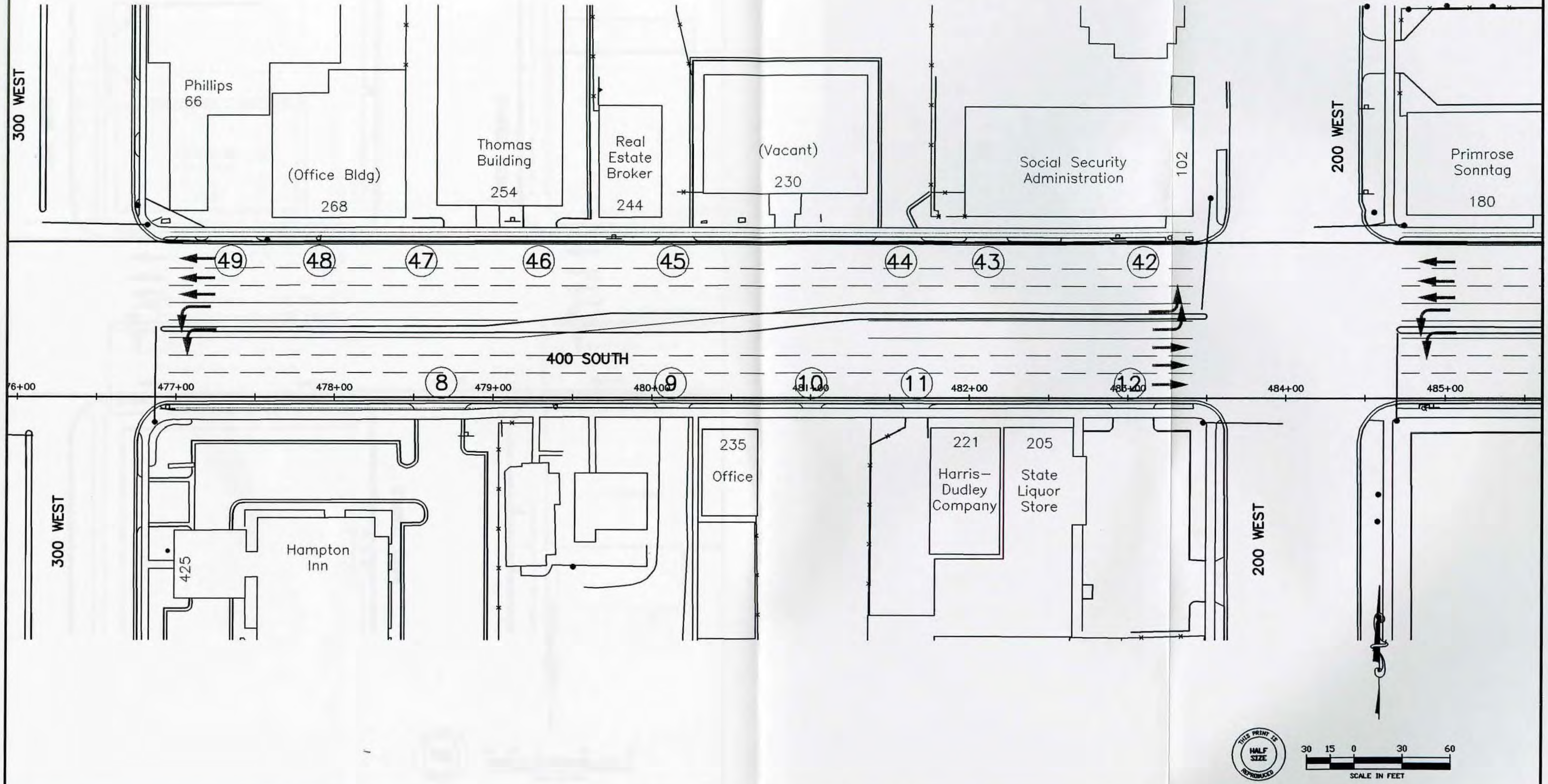
# Driveway Impacts Along 400 South Between 400 West and 300 West

Figure 4.4-1

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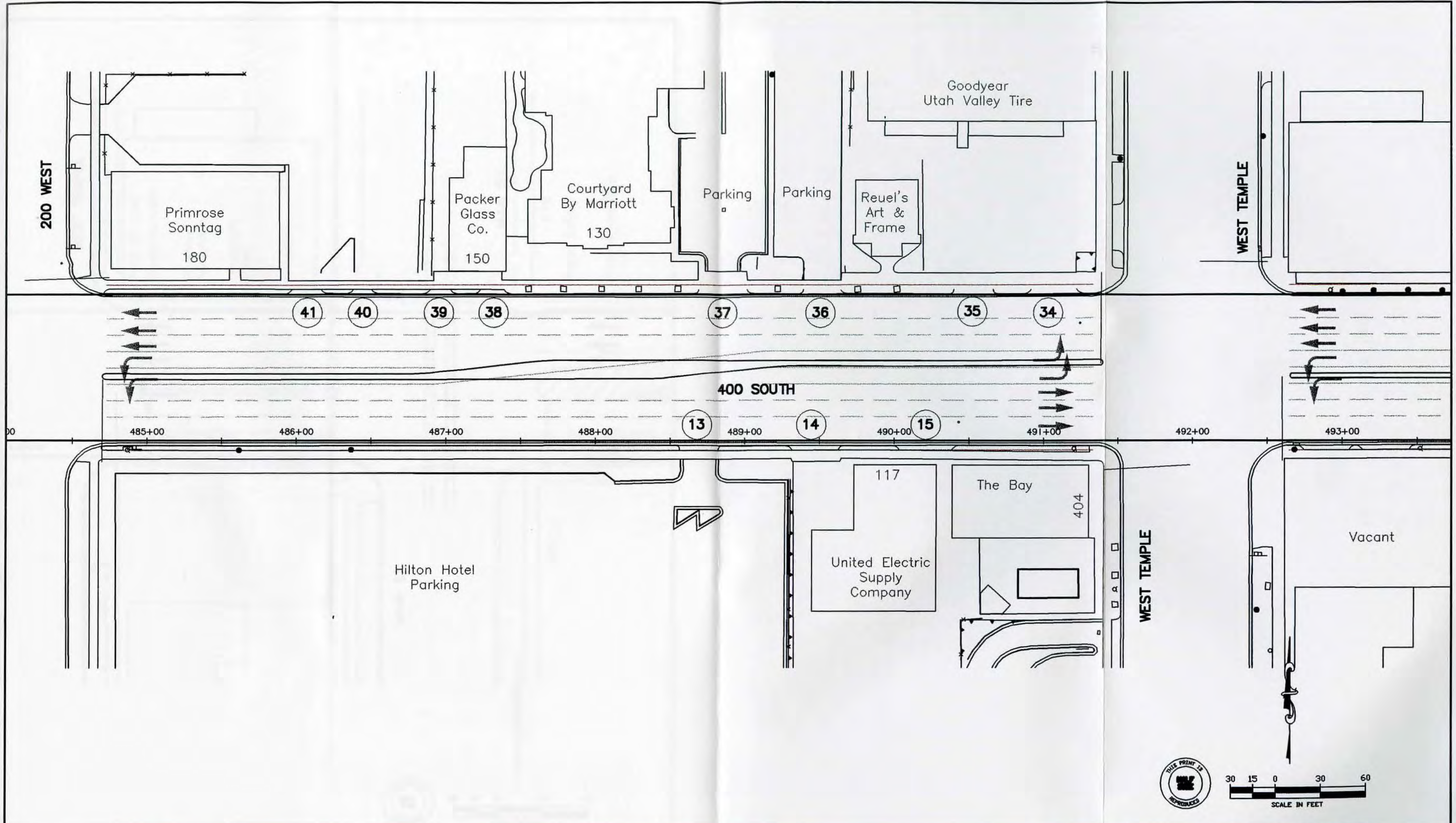
Driveway Impacts
Along 400 South
300 West and 200 West

Figure 4.4-2

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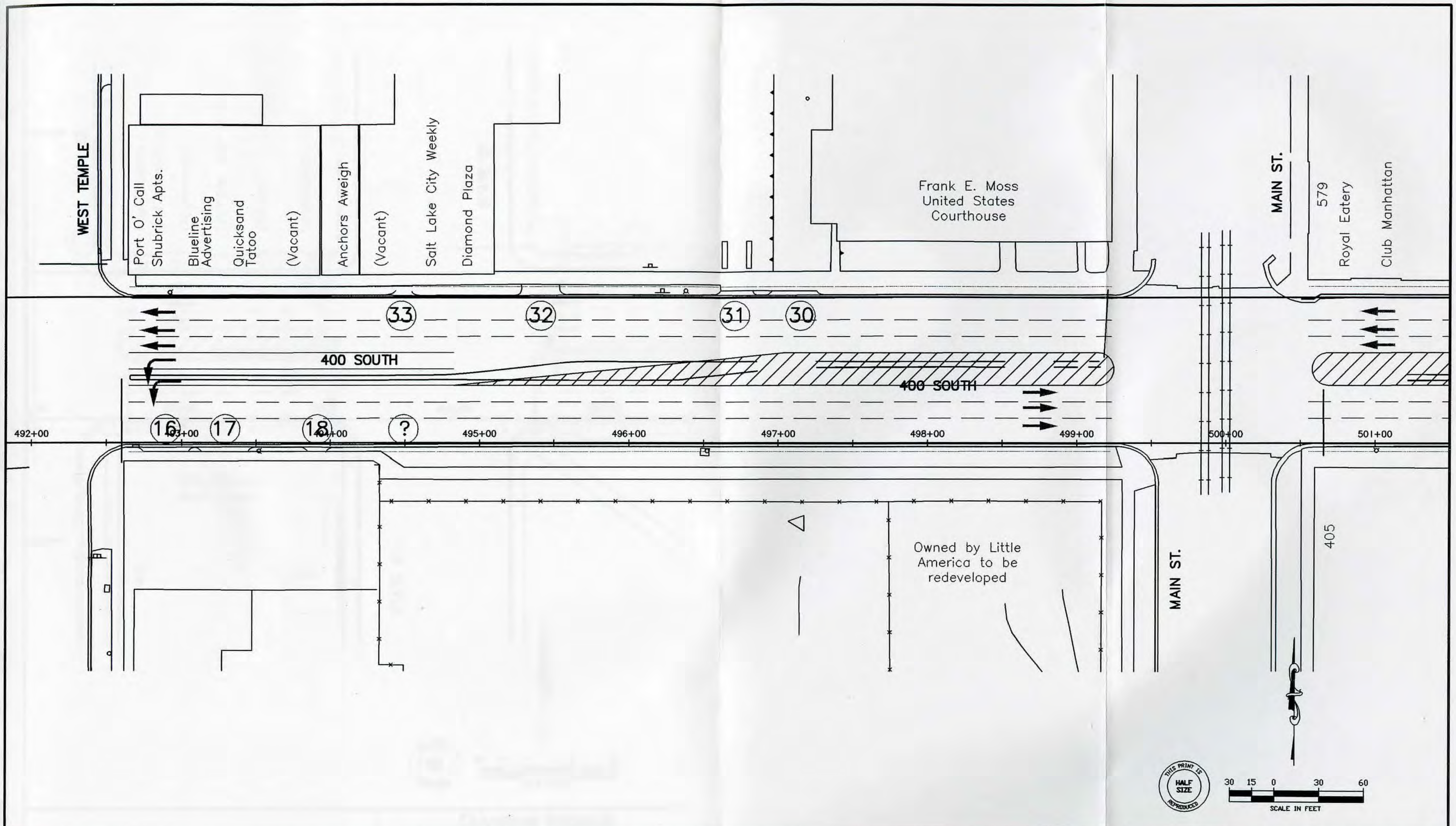
# Driveway Impacts Along 400 South Between 200 West and West Temple

Figure 4.4-3

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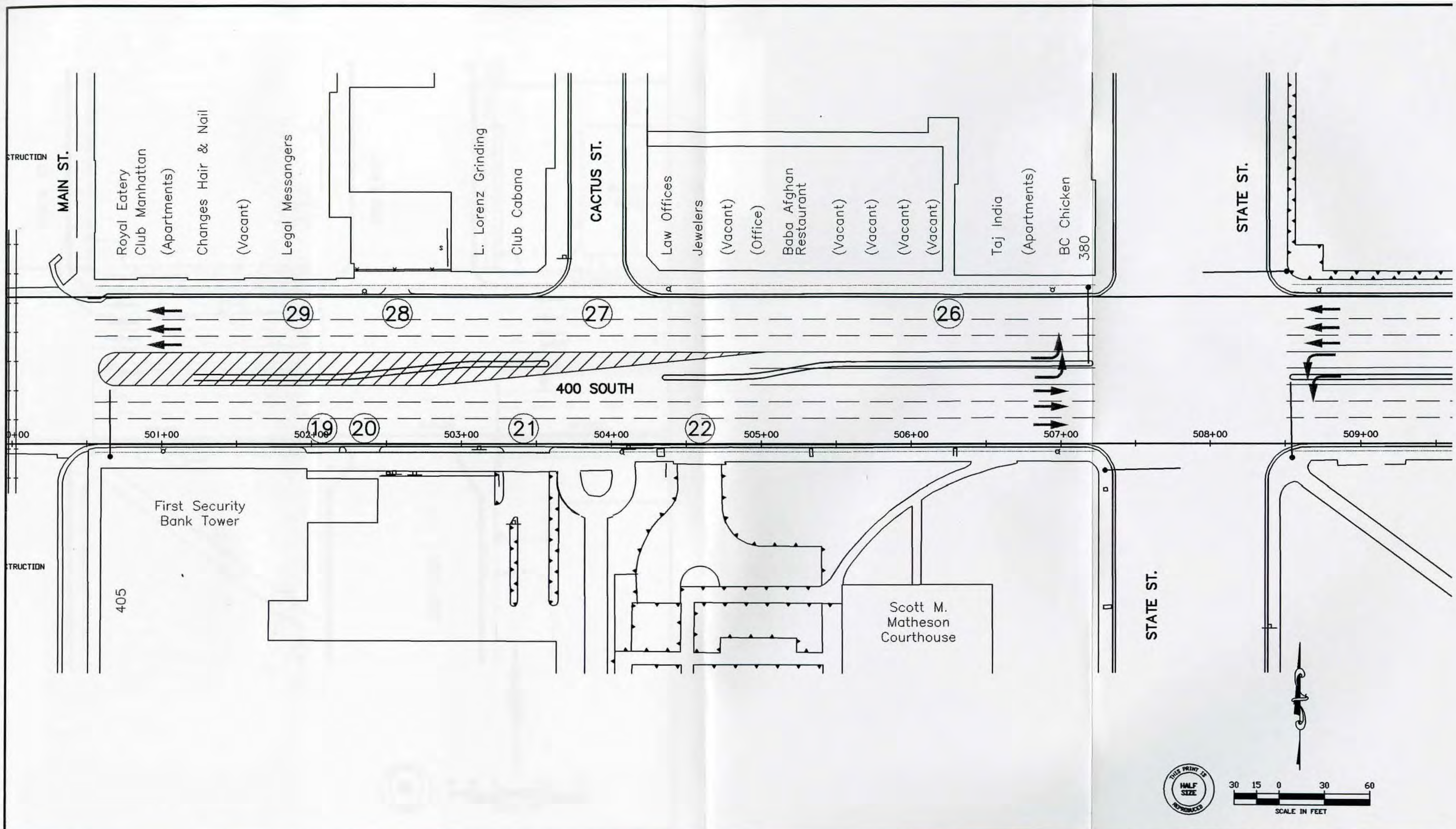
Driveway Impacts
Along 400 South Between
West Temple and Main Street

Figure 4.4-4

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**Driveway Impacts Along 400 South Between Main Street and State Street**

Figure 4.4-5

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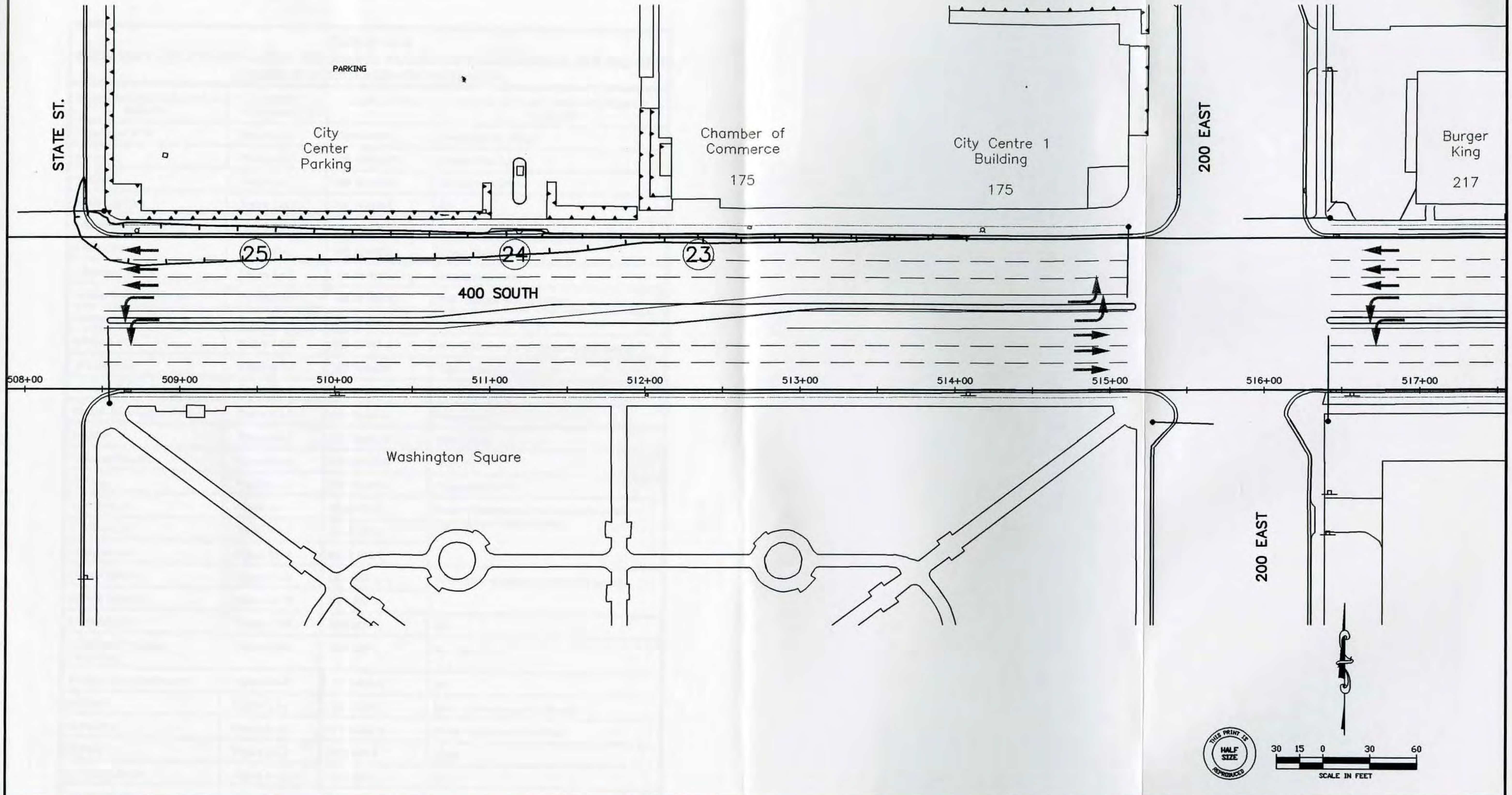


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**Driveway Impacts Along 400 South Between State Street and 200 East**

Figure 4.4-6

## TABLE 4.4-4
## DRIVEWAY LOCATIONS ALONG 400 SOUTH: ADDRESSES/BUSINESSES SERVED AND CONSOLIDATION/CLOSURE POTENTIAL

| DRIVEWAY IDENTIFICATION NUMBER | FIGURE REFERENCE # | ADDRESS/ USE | POTENTIAL FOR CONSOLIDATION OR CLOSURE |
|---|---|---|---|
| 1 Positively 4th St. | Figure 4.4-1 | 375 W/400 S | No-access to garage |
| 2 Vacant | Figure 4.4-1 | 365 W 400 S | Consolidate w/#3 |
| 3 Vacant | Figure 4.4-1 | 361 W 400 S | Consolidate w/#2 |
| 4 Hub Cap City | Figure 4.4-1 | 351 W 400 S | No |
| 5 Roller Tran | Figure 4.4-1 | 343 W 400 S | No - access to garage |
| 6 Roller Tran | Figure 4.4-1 | 343 W 400 S | Consolidate w/#7 |
| 7 Western Nut Co. | Figure 4.4-1 | 327 W 400 S | Consolidate w/#6 |
| 7a Best Rate Rent-a-Car | Figure 4.4-1 | 300 W 400 S | Yes - access from 300 West |
| 8 Hampton Inn | Figure 4.4-2 | 287 W 400 S | Yes - access on 300 W |
| 9 Pleasant Ct. | Figure 4.4-2 | 235 W 400 S | No - 2 homes and businesses only access |
| 10 Vacant Lot | Figure 4.4-2 | 229 W 400 S | Yes - consolidate with #11 |
| 11 Harris Dudley Co. | Figure 4.4-2 | 221 W 400 S | No - only access |
| 12 Utah State Liquor Store | Figure 4.4-2 | 205 W 400 S | Yes - close |
| 13 Hilton | Figure 4.4-3 | 127 W 400 S | Yes - close |
| 14 United Electric | Figure 4.4-3 | 117 W 400 S | No |
| 15 Alley | Figure 4.4-3 | 111 W 400 S | Consolidate w/#14 |
| 16 Vacant Lot | Figure 4.4-4 | 95 W 400 S | Closure dependent on future development (access from West Temple) |
| 17 Vacant Lot | Figure 4.4-4 | 91 W 400 S | |
| 18 Vacant Lot | Figure 4.4-4 | 85 W 400 S | |
| 19 First Security | Figure 4.4-5 | 28 E 400 S | Potential if relocation of drive-thru occurs |
| 20 First Security | Figure 4.4-5 | 28 E 400 S | |
| 21 Parking Lot | Figure 4.4-5 | 28 E 400 S | No |
| 22 Scott M. Matheson Courthouse | Figure 4.4-5 | 80 E 400 S | No - parking lot |
| 23 Chamber of Commerce | Figure 4.4-6 | 175 E 400 S | No |
| 24 Alley | Figure 4.4-6 | 155 E 400 S | Yes - access moved to State St |
| 25 Nothing | Figure 4.4-6 | 151 E 400 S | Close - Curb cuts to nothing |
| 26 Alley | Figure 4.4-5 | 73 E 400 S | Close |
| 27 Cactus Street | Figure 4.4-5 | 41 E 400 S | No |
| 28 Lazy Moon | Figure 4.4-5 | 21 E 400 S | No |
| 29 Alley | Figure 4.4-5 | 19 E 400 S | Yes |
| 30 Frank E Moss Courthouse | Figure 4.4-4 | 14 W 400 S | No |

| TABLE 4.4-4<br>DRIVEWAY LOCATIONS ALONG 400 SOUTH: ADDRESSES/BUSINESSES SERVED AND CONSOLIDATION/CLOSURE POTENTIAL | | | |
|---|---|---|---|
| DRIVEWAY IDENTIFICATION NUMBER | FIGURE REFERENCE # | ADDRESS/ USE | POTENTIAL FOR CONSOLIDATION OR CLOSURE |
| 31 Parking Lot | Figure 4.4-4 | 16 W 400 S | Yes - access to Market St |
| 32 Court House Parking | Figure 4.4-4 | 50 W 400 S | Yes |
| 33 Diamond Plaza | Figure 4.4-4 | 56 W 400 S | No |
| 34 Good Year Tire | Figure 4.4-3 | 378 S West Temple | Yes - provide access off West Temple |
| 35 Good Year Tire | Figure 4.4-3 | 378 S West Temple | |
| 36 Reuel's | Figure 4.4-3 | 116 W 400 S | Yes - provide access off West Temple |
| 37 Courtyard | Figure 4.4-3 | 130 W 400 S | Yes - access off 200 W |
| 38 Packer Glass | Figure 4.4-3 | 150 W 400 S | No -access to garage |
| 39 Packer Glass Alley | Figure 4.4-3 | 152 W 400 S | No - to back parking |
| 40 Nothing | Figure 4.4-3 | 156 W 400 S | Yes - Curb cuts to nothing |
| 41 Primrose Sonntag | Figure 4.4-3 | 180 W 400 S | Yes - access on 200 W |
| 42 Social Security Admin | Figure 4.4-2 | 210 W 400 S | Consolidate w/#43 |
| 43 Social Security Admin | Figure 4.4-2 | 212 W 400 S | No |
| 44 Vacant Lot | Figure 4.4-2 | 230 W 400 S | No |
| 45 A-Answer | Figure 4.4-2 | 244 W 400 S | No |
| 46 Thomas Bldg. | Figure 4.4-2 | 254 W 400 S | Consolidate w/#47 |
| 47 Thomas Bldg. | Figure 4.4-2 | 254 W 400 S | Consolidate w/#46 |
| 48 Office Bldg. | Figure 4.4-2 | 268 W 400 S | Consolidate w/#46, 47 |
| 49 Phillips 66 | Figure 4.4-2 | 294 W 400 S | Yes - access off 300 W |

# 4.5 BICYCLE FACILITIES

## 4.5.1 Planned Bicycle/LRT Access

Passengers who are not within walking distance of an LRT station may choose to ride a bike t access the system. Bicycle racks will be provided at major LRT stations and at park/ride lots. I accordance with UTA policy, LRT will accommodate bicycles, however, it may be necessary to lim the number of bicycles allowed to board during peak periods of travel. LRT stations and bus stop will be located at major cross points or intersections of regional bicycle routes and pedestrian trail

## 4.5.2 Impacts on Existing/Planned Bicycle Facilities

The potential impacts of LRT on existing bicycle facilities are primarily along sections of the corrid that carry designated bicycle routes along with LRT and general traffic. These sections are limite to North Temple west of 600 West, South Campus Drive between Guardsman Way and Wasatch Boulevard, and Wasatch Boulevard between South Campus Drive and Medical Drive.

**North Temple**

In this section, existing conditions include uni-directional striped bicycle lanes adjacent to the curbs. These lanes are currently removed under the temporary detour striping for three traffic lanes in each direction during construction work on I-80 and I-15. Preliminary studies of the critical (most conservative) cross sections at in-street LRT stations indicate that the bicycle lanes can be maintained without interruption when North Temple reverts to its pre-detour condition of two traffic lanes in each direction.

At the west end of North Temple, there is no impact on the west-bound (north curb) bicycle lane where it transitions to the Class 1 bi-directional facility on the airport property. The east-bound (south curb) bicycle lane will cross the LRT tracks (without a skew) west of 2400 West where the tracks turn off North Temple to the south. At 2400 West, the route (Class 3 in this section) will turn south and cross to the south side of the North Temple diversion, using the existing signalized intersection. The route will continue east as a Class 2 curb lane.

**South Campus Drive and Wasatch Blvd.**

The inclusion of LRT within the existing ROW of South Campus Drive will affect the feasibility of including a split Class 2 bicycle facility in the remaining cross section assigned to vehicular traffic. Given the relative slow traffic speeds and volumes in this section, a preliminary recommendation is to mix bicycles with general traffic as a Class 3 facility.

At the intersection of South Campus Drive and Wasatch Boulevard, it will be necessary for both directions of the bicycle route to cross the LRT tracks before proceeding north as Class 2 bi-directional curb lanes on Wasatch. This intersection will be redesigned to mitigate a potentially unsafe "skew" at the track crossing. A skew of less than 60 degrees creates a condition where bicycle wheels can drop into the track flangeway causing the bike to stall and pitch the rider.

Along Wasatch Boulevard, there is no impact of the trackway on the bicycle lanes. However, LRT vertical clearances do impact the final profile of a proposed pedestrian overpass south of the Medical Drive intersection. This potential impact will also be addressed during Preliminary Engineering.

**Intersecting Bicycle Routes**

The LRT trackage has minimal negative impact on north-south bicycle routes crossing the LRT corridor. It is considered safe for bicycles to cross rail trackage on a perpendicular bearing (a skew angle of 90 degrees).

## 4.6 PEDESTRIAN FACILITIES

### 4.6.1 Pedestrian Circulation

Generally, LRT development will have a positive impact on pedestrian circulation. At all stations in the centers of major streets, signalized crosswalks will be located at the intersection end of the platform to facilitate pedestrian movement to and from the station. One end of the platform will connect to the intersection crosswalk. Future installation of signalized mid-block crossings at the other end of the platforms could occur as pedestrian volumes warrant. The signalized croswalks serving the platforms will also serve pedestrians crossing the streets that are not using trnsit.

LRT will also have positive impacts at key specific locations. At the eastern terminusof the corridor, the station may combine with joint development (a proposed "medical hotel") to rovide accessible vertical circulation from Medical Drive to higher elevations of the University redical complex. This improvement will benefit pedestrian circulation within the medical compex not associated with transit use. Similarly, a proposed pedestrian overcrossing of 500 Soth, not included as part of this project, will serve the adjacent LRT station while benefitting nort-south pedestrian circulation between the University campus and major facilities and areas suth of Foothill Boulevard.

### 4.6.2 Pedestrian Access to LRT Vehicles

The front door on each LRT vehicle will be designed to accept passengers from a "higt block" which has a ramp that can provide access to physically impaired persons. Shelters an other passenger amenities will be available to accommodate passengers waiting for the next LR' train.

### 4.6.3 North-South LRT Pedestrian Transfers

In the case of LRT, special attention will be given to location and design of transit stationswhere passengers will be transferring to the North-South LRT line. Stations will be located to rmimize the walking distance between stops on the two LRT lines. Shelters and other passenger arenities will be available to protect passengers from adverse weather. Pedestrian cross walks wit traffic signal control will be provided at all stations located in the center of a street.

# SECTION 5
# ENVIRONMENTAL CONSEQUENCES

## 5.1 INTRODUCTION

This section discusses the anticipated effects and impact analysis results of both the No-Build and the LRT Alternative on the natural and manmade environment within the West-East Corridor. Where appropriate, the five geographic subareas (as discussed in Section 3) are noted for the environmental resource or issue being analyzed. Where visual and aesthetic issues apply to specific locations or sites along the proposed corridor, they are addressed separately within the discussion of corridor areas below. The environmental resources discussed in this Section are visual and aesthetics, land use, parks and open space, historic and cultural resources, socio-economics, ecosystems, wetlands, water resources and floodplains, mineral resources, noise and vibration, utilities, air quality, potential contaminant sources, energy, and public safety and security. A summary of cumulative effects and a summary of construction impacts are included as separate sections at the end of this FEIS Section.

## 5.2 VISUAL AND AESTHETICS

There are several general issues of visual quality and aesthetics that are common to light rail transit in all areas along the proposed corridor. Visual and aesthetic concerns include the effect to views and vistas, the character of the setting and urban environment, and pedestrian movement. With the presence of LRT, it will be important to preserve visibility so pedestrians can easily and safely move between the station platform and the edge of the road.

The broad vistas of the valley and mountains generally are not adversely affected by the presence of LRT on the streets, nor are the specific view corridors identified by Salt Lake City. Catenary poles, wires, tracks, and platform structures needed for LRT will be a visible element, but with all of the existing development they should soon become an expected part of the streetscape. In an urban setting, wires, poles, and even tracks are not unexpected elements. They will be new initially, but will soon blend into the urban setting, as do the existing features of the streetscape such as street lights, traffic signals and other elements of the urban setting. Site- or area-specific concerns are addressed below. The visual and urban design features of the West-East LRT project are shown in Figures 5.2-1 through 5.2-~~6~~ 7 in Section 5.2-6.

### 5.2.1 Airport

**No-Build Alternative**

The No-Build Alternative is anticipated to have no adverse consequences to visual quality and/or aesthetics.

**LRT Alternative**

The LRT Alternative would have no adverse consequences to visual quality and/ or aesthetics in this area. Salt Lake International Airport, a principal gateway to Salt Lake City, creates a first impression for many visitors. The proposed airport transit station will be an integral part of the new airport architecture and design, and will be cohesive with airport ambiance and activity. Timely and convenient access to public transportation serving downtown Salt Lake City is a desirable asset to visitors, travelers, and employees.

Undeveloped land will ultimately be developed, especially with the introduction of public transportation systems that better serve the area. The potential for change to the visual environment and impacts to the sense of arrival at the airport should be carefully considered as new development is proposed, but LRT can be designed to fit into that development without significant visual impact. The alignment of the track along the edge of the highway and within highway right-of-way is a compatible image with existing and proposed airport development.

The proposed LRT storage and maintenance facility will be located at about 2500 West, adjacent to the I-80 access road. Its design should present a positive image along the highway and appear to fit into nearby hotel, office and airport service uses and development.

### 5.2.2 North Temple

**No-Build Alternative**

The No-Build Alternative would have no adverse consequences to visual quality and/or aesthetics because there would be no alterations to the existing environment. However, the existing clutter in the area would likely continue without the benefit of redevelopment potential, which may improve visual quality.

**LRT Alternative**

The LRT Alternative would have no adverse consequences to visual quality and/ or aesthetics in this area. The development and redevelopment potential likely to occur because of transit development presents an opportunity to improve visual quality along the route and at the station platform locations. At each of these locations there are opportunities for new and expanded development and redevelopment which could be designed to complement LRT and its riders. Thus, LRT should not degrade visual quality, and may actually improve the visual and aesthetic characteristics of the area. The proposed park and ride lot across from the Utah State Fairpark should include landscaping and other appropriate visual elements, and present a positive image along North Temple.

### 5.2.3 Downtown

**No-Build Alternative**

The No-Build Alternative would have no adverse consequences to visual quality and/or aesthetics. Some of the improvements associated with the No-Build Alternative, such as removal of the viaducts and railroads, would actually create positive visual change in the area. With this activity and the potential for redevelopment, the area could generally improve the entrance to the city and Gateway District.

**LRT Alternative**

The LRT Alternative would have no adverse consequences to visual quality and/or aesthetics in this area. The presence of transit in the center of the roadway along 400 West could have positive impacts on visual quality due to its influence on proposed land use and development changes imminent along the street with the development of the Gateway District.

Along 400 South the alignment switches to curb-side along both sides of the street in an area that is adjacent to new civic and convention uses. This environment is very urban in context and appearance, is transitioning to higher density uses with even stronger urban form, and is likely to be a major destination in the City. The presence of LRT along the roadways will be visible; however, it is in context with the urban landscape and consistent with emerging development patterns. As LRT is developed along the street, it should be carefully integrated into the urban design of the streetscape and adjacent uses.

### 5.2.4 400 South

**No-Build Alternative**

The No-Build Alternative would have no adverse consequences to visual quality and/or aesthetics in this area.

**LRT Alternative**

The LRT Alternative would have no adverse consequences to visual quality and/ or aesthetics in this area. Aesthetically, LRT is very compatible with the commercial character of the area, and fits into the bustling retail and commercial developments.

Between 1000 East and University Avenue (one block east of 1300 East), some single family residential uses occur, along with some multi-family structures and occasional small commercial uses. These residences are currently located on a heavily traveled route to and from the University and downtown, and the aesthetic impact of LRT should be minimally different from the impact of increased automobile traffic and congestion.

### 5.2.5 University

**No-Build Alternative**

The No-Build Alternative would have no adverse consequences to visual quality and/or aesthetics.

**LRT Alternative**

While LRT should fit in well with the visual environment at the University main campus and the Health Sciences Center, there will be places where the visual environment will have adverse impacts. Specifically, adverse impacts include the loss of street trees along South Campus Drive, Wasatch Boulevard and Medical Drive in certain sections where expansion of the paved roadway surface is required to accommodate LRT. Sections that will be widened include South Campus Boulevard to Rice-Eccles Stadium, on either side of the gap between the stadium and the field house, some blocks between the stadium and the Huntsman Center, and at the intersection of Wasatch Boulevard.

Once the alignment turns onto Wasatch Boulevard, the LRT alignment right-of-way (ROW) will be maintained at the existing curbline on the east side of Wasatch Boulevard. Therefore, the existing sidewalks and mature trees on the east would not be removed. In many cases, the trees are very large, very old, and add to the aesthetic quality of this area. Some street trees will be removed on the west side of Wasatch Boulevard to accommodate the widening of the roadway. It may also be necessary to construct retaining walls along the parking lot at this location to minimize ROW needs for construction.

Views to the University of Utah and the mountain backdrop are important to the community's perception of itself. The scale of the development associated with the LRT line is very small, while the scale of the University development as viewed from the distance is perceived as quite large. Visibility of the LRT line and catenary will be insignificant in the overall viewshed. The mountain backdrop immediately behind the University is monumental in scale. The LRT line and catenary will be an insignificant element in the view.

### 5.2.6 Visual and Aesthetic Mitigation

As part of the West-East Light Rail Project preliminary engineering, urban design features for the LRT system were developed. Figures 5.2-1 through 5.2-7 show representative examples (plan views, a perspective, and cross-sections) of the West-East LRT's urban design features and amenities on North Temple, 400 South, and the University of Utah campus respectively.

Visual setting and urban form mitigation is best addressed in designing the elements of the system. The resident and business community will be engaged in the design phase in the urban design and aesthetic review of the transit system. The stations and maintenance facility will be designed to blend into the fabric and character of the streets, and reflect the quality and excellence in design. Screening, landscaping, and other mitigation measures will be used where necessary, as determined in the design phase of the project. Also, during the design phase, efforts will be made to minimize the removal of mature trees within the corridor. New trees will be planted as the street improvements are made and landscaped elements replaced that conform to the image and character already established. On campus, this will be accomplished by working closely with University of Utah Facilities Planning and Red Butte Garden and Arboretum, since the campus is part of the Arboretum (see Figures 5.2-1 through 5.2-7).

Pedestrian crossings will be clearly identified for both the pedestrians using them and vehicles in the roadway. In all cases, pedestrian crossings to station platforms will be signal controlled and phased to allow disabled patrons time to cross safely.

## 5.3 LAND USE

This section addresses land use, secondary development (new development potential arising from the project) and community impacts resulting from the two alternatives within the five corridor subareas.

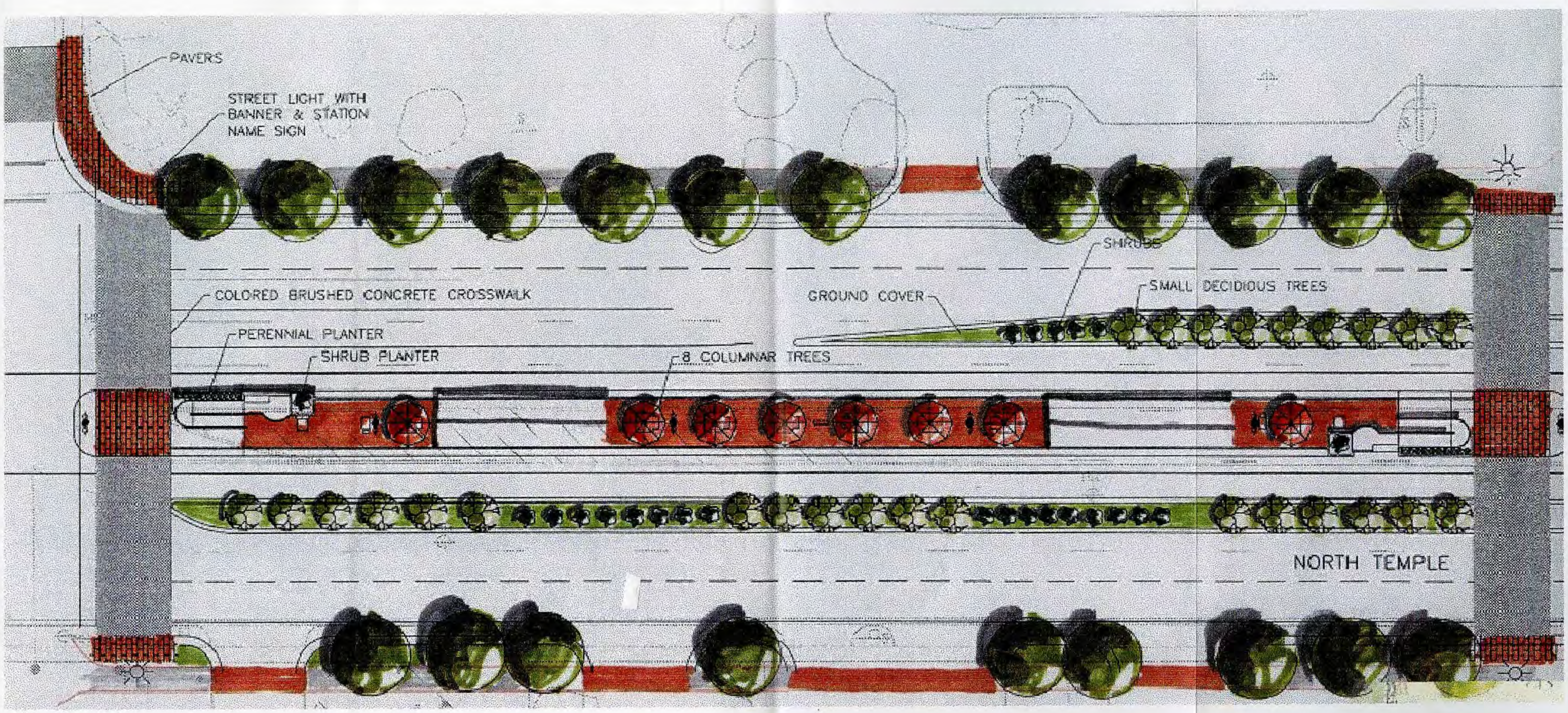
### 5.3.1 Airport

**No-Build Alternative**

With the No-Build Alternative, current growth trends and land development patterns would likely continue. This would mean a continuation of manufacturing and airport-related land uses in the area. With this continuing pattern it is unlikely that residential neighborhoods would develop in the area. Any potential for secondary development opportunities on the undeveloped land which increases density or encourages a higher use for land is unlikely to occur with the No-Build Alternative.

**LRT Alternative**

The SLCIA is currently in the design stage of a major expansion. Under the LRT Alternative the airport would receive improved access to public transportation for both patrons and employees,

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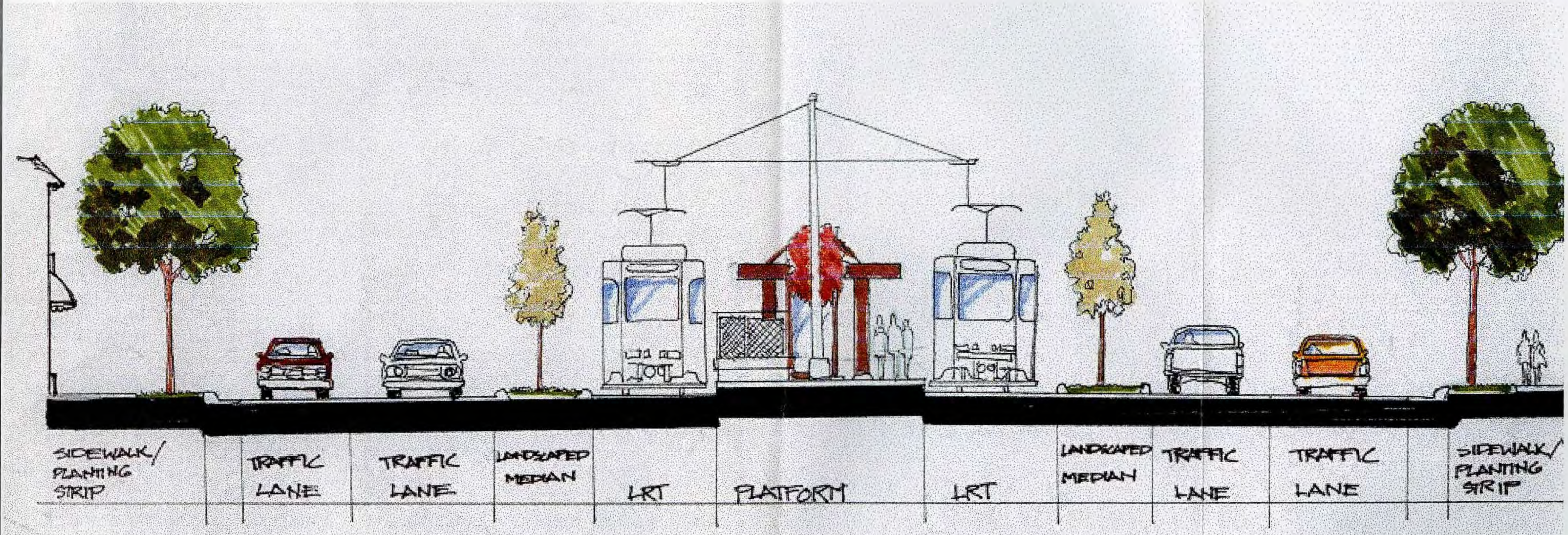
Plan View Urban Design
North Temple

Figure 5.2-1

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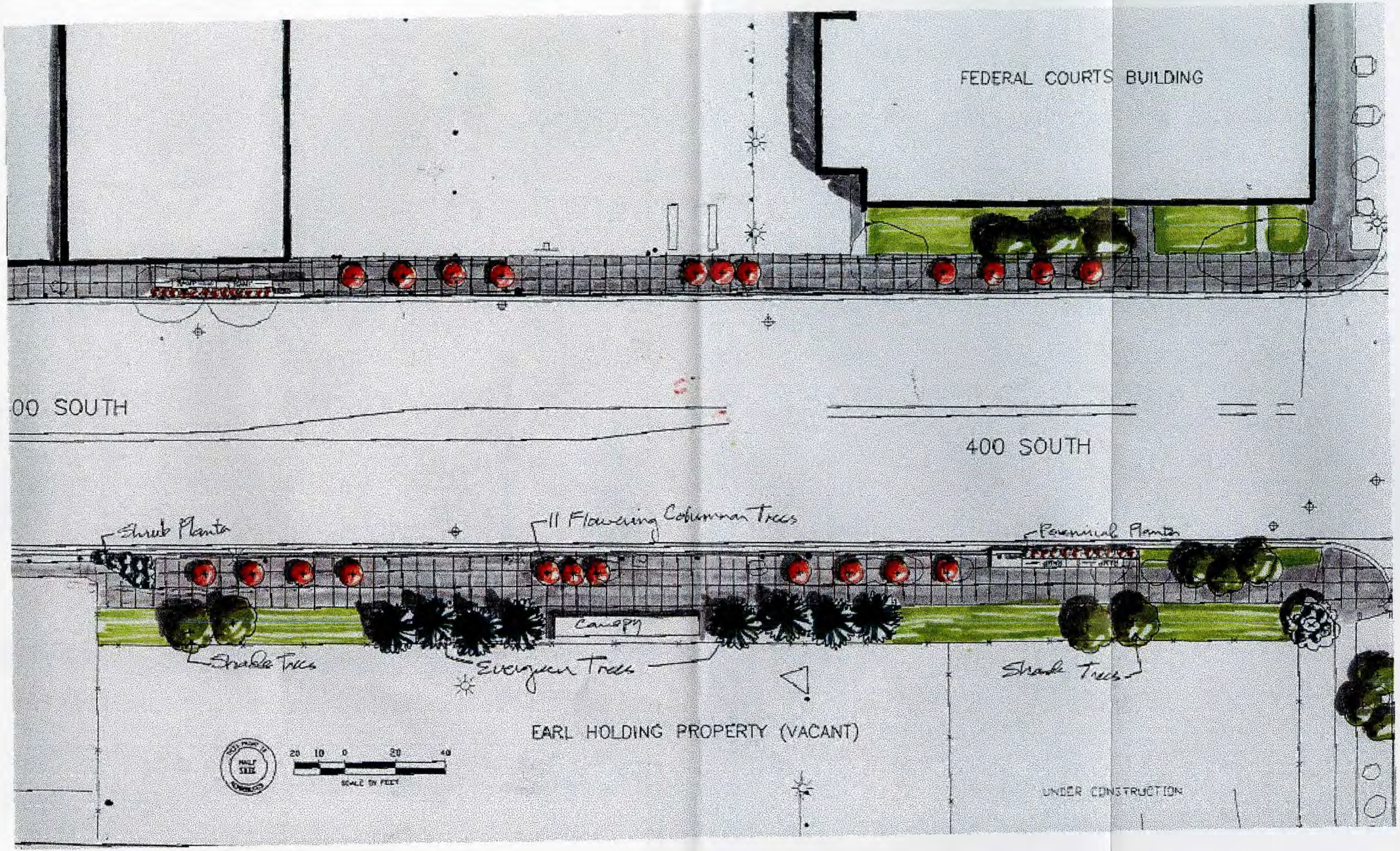
Cross-Section Urban Design
North Temple

Figure 5.2-2

Cross-Section Urban Design - North Temple

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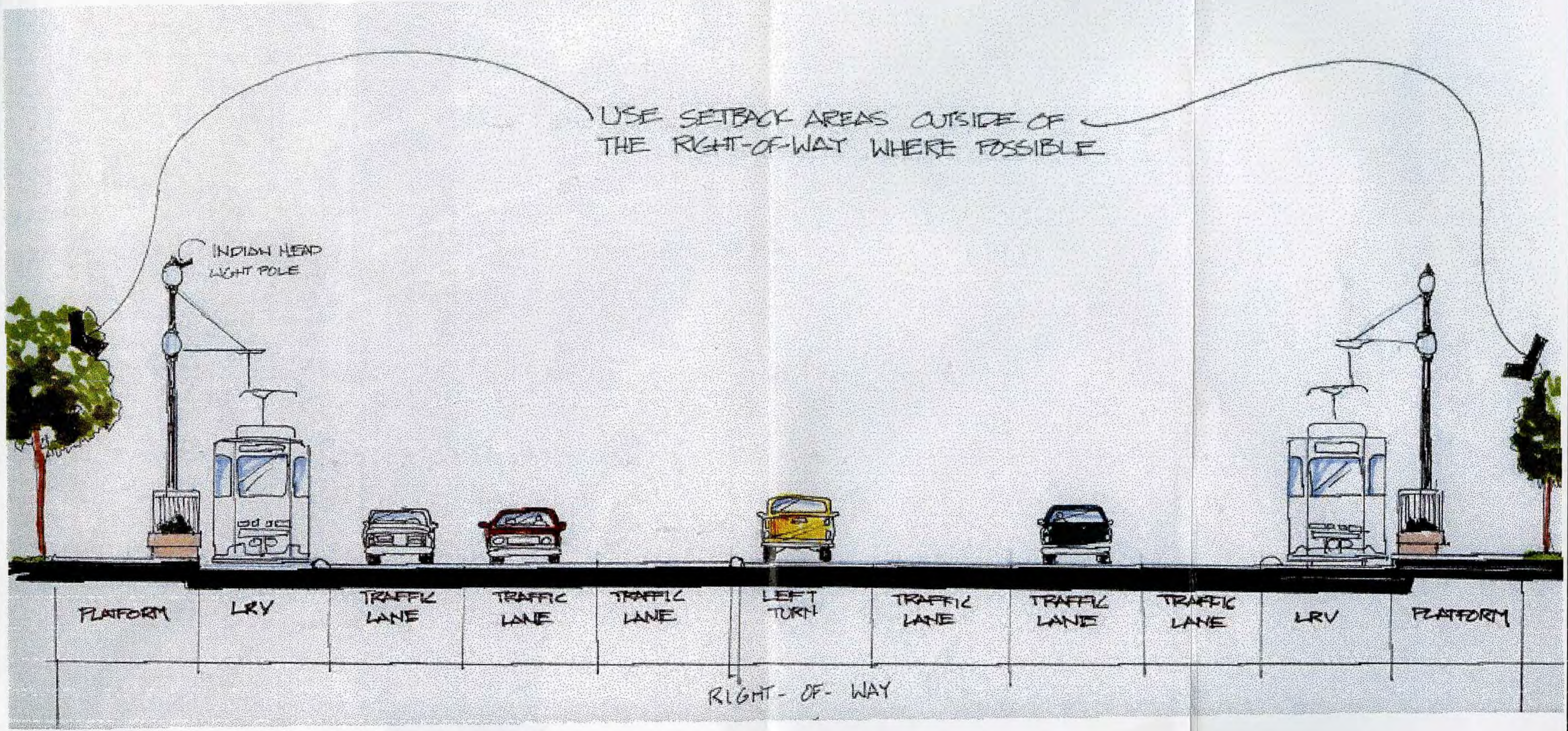
SOUTH JORDAN, UTAH 84095 (801) 553-1944

Plan View Urban Design
400 South

Figure 5.2-3

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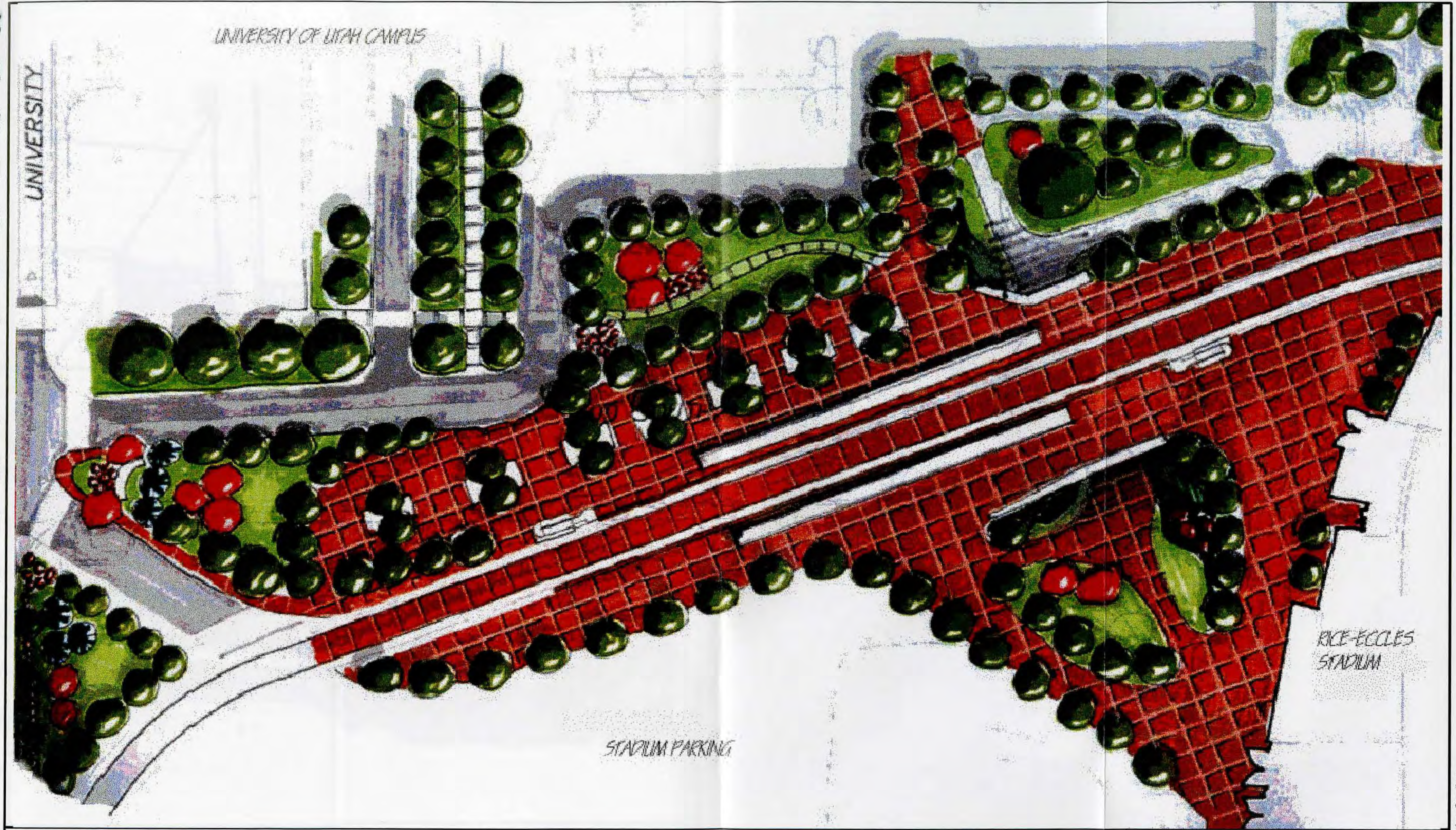
Cross-Section Urban Design
400 South

Figure 5.2-4

Cross-Section Urban Design - 400 South

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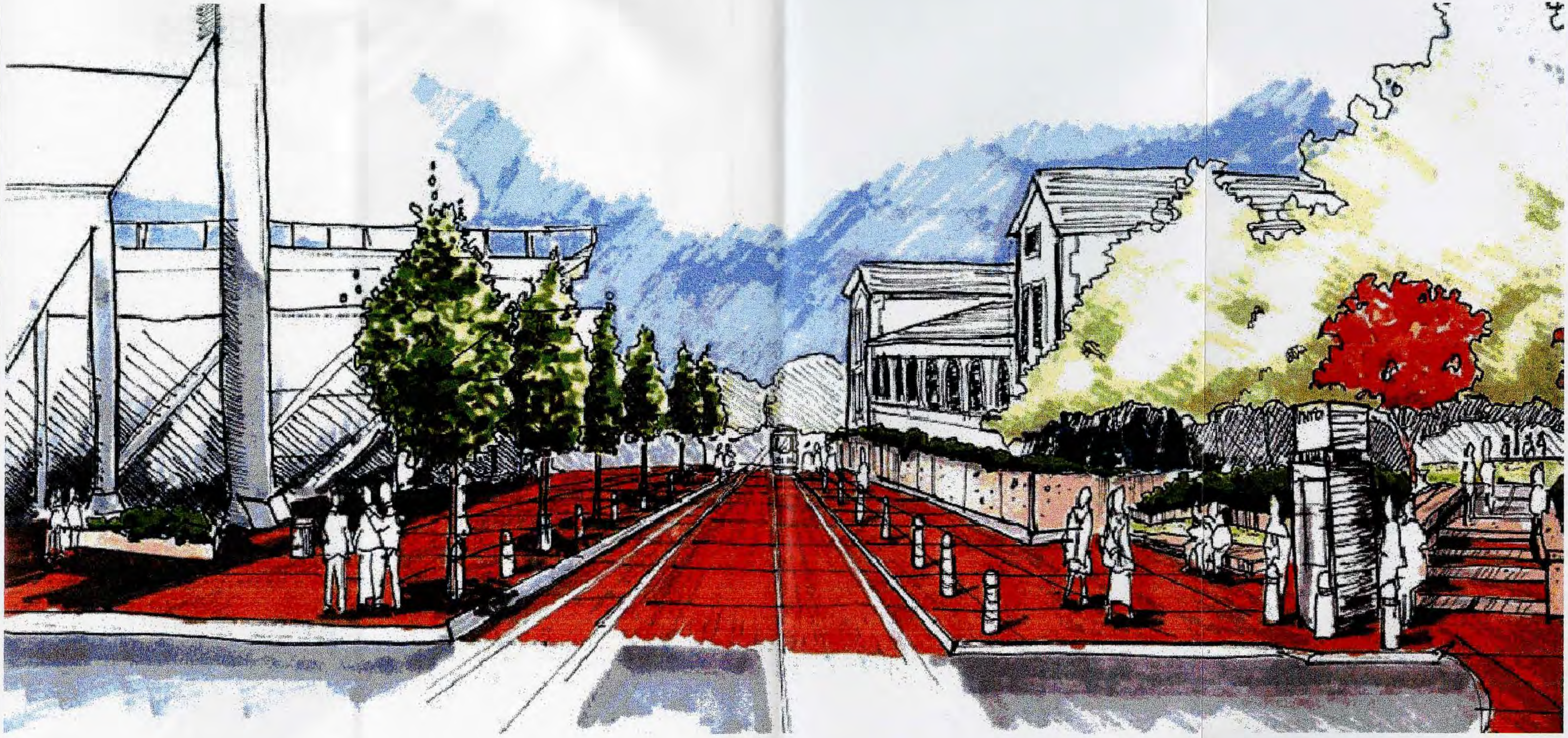
Plan View
Rice-Eccles Stadium
LRT Station

Figure 5.2-5

Plan View Rice-Eccles Stadium



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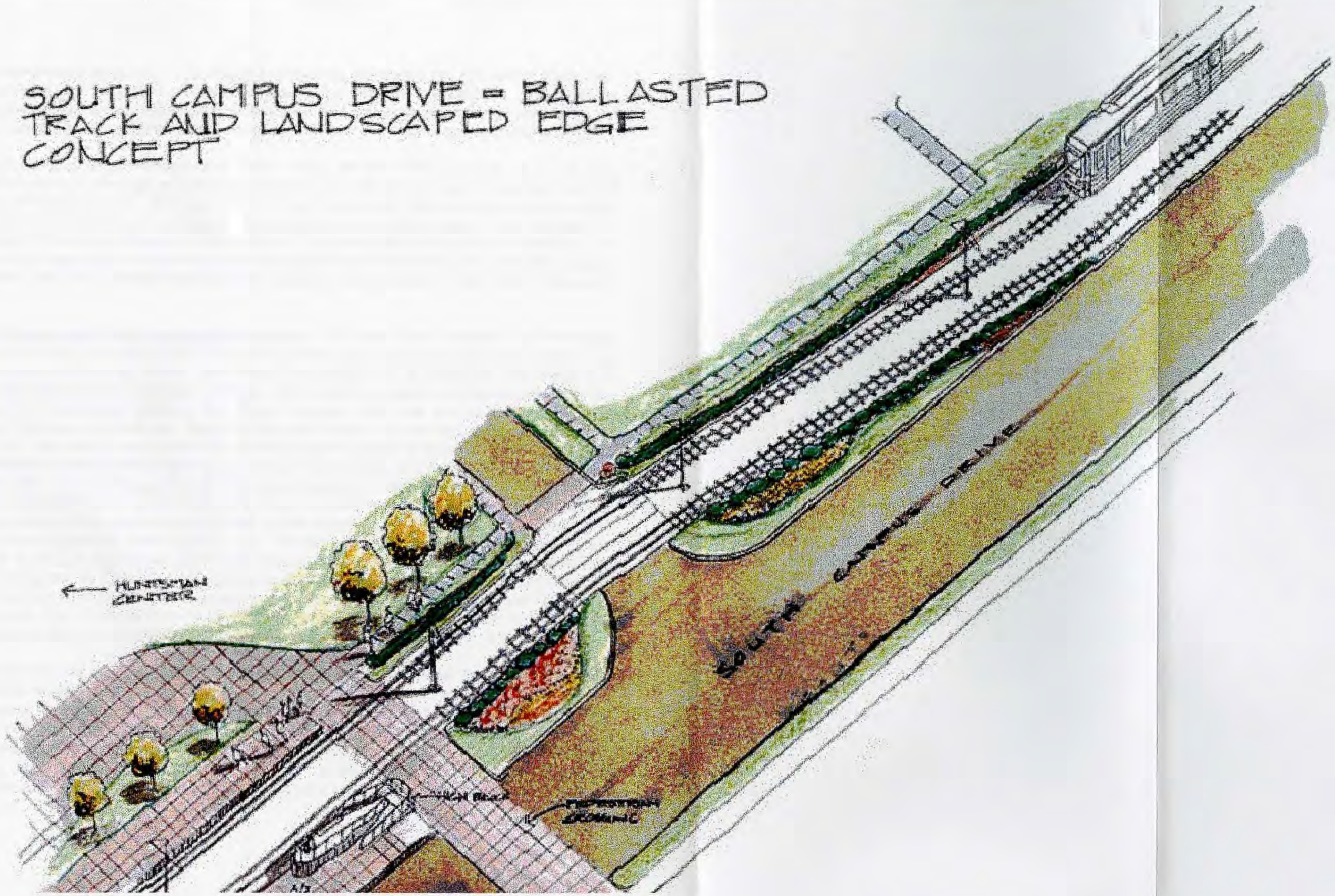
Perspective
Rice-Eccles Stadium
LRT Alignment

Figure 5.2-6

Perspective Rice-Eccles Stadium LRT Alignment

SOUTH CAMPUS DRIVE - BALLASTED TRACK AND LANDSCAPED EDGE CONCEPT

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Plan View
Huntsman Center
LRT Alignment & Station

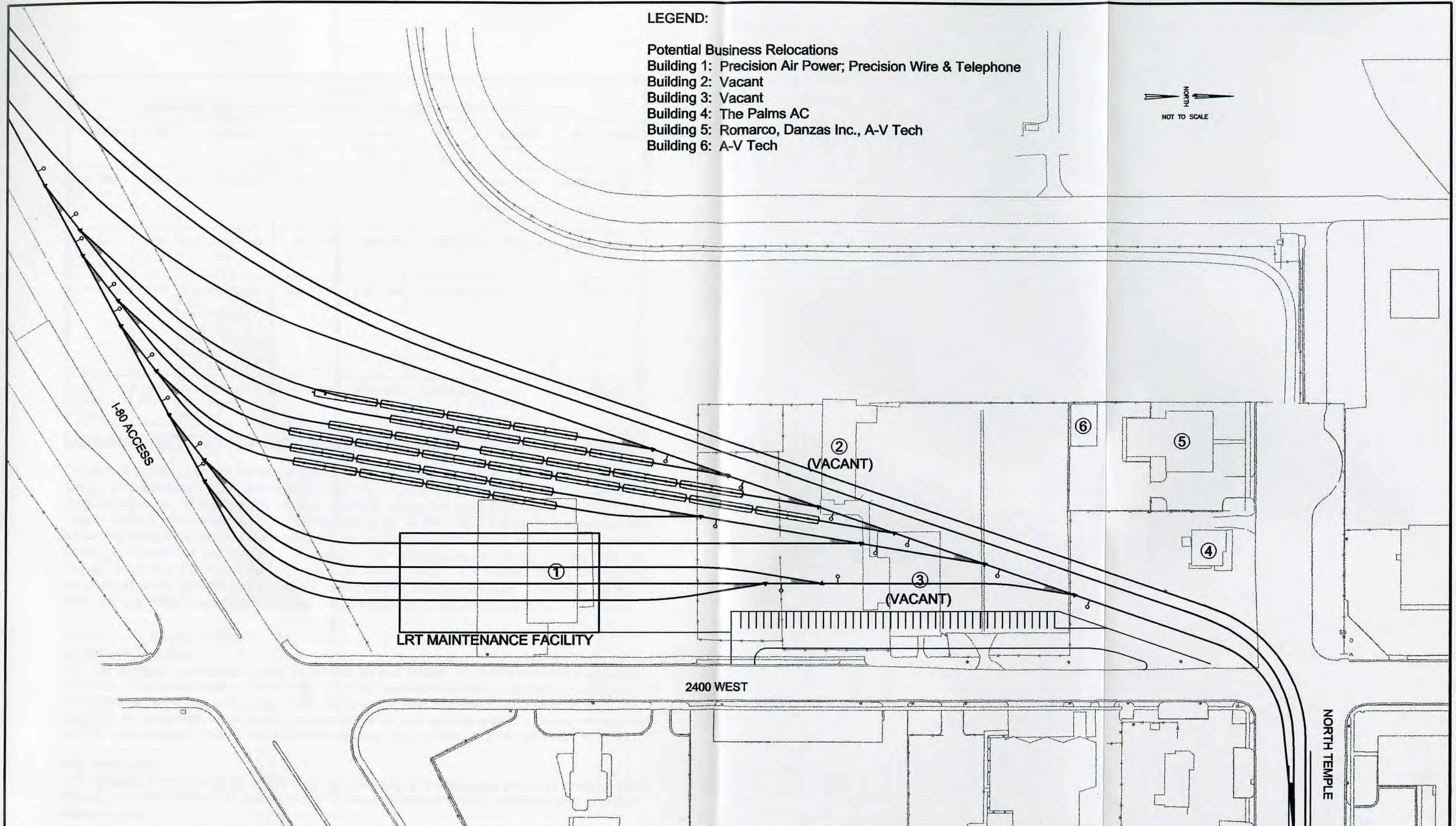
Figure 5.2-7

thus reducing demand for parking. The Airport LRT station, integrated into the design of the new terminal facilities, will provide beneficial service to the airport. LRT will be a stimulus to airport-related activity and development. Access will also be provided to the airport rental car center and the International Center, via a people mover and bus shuttle system, respectively.

Existing airport and airport-related land uses would benefit from proximity to a planned transportation corridor, although consideration needs to be given to the height restrictions around the Runway Protection Zone. With proximity of transit, secondary development potential would likely increase pressures for development. Increased access to public transit may increase the attractiveness of the area to residential development. In areas south of the airport residential uses should be discouraged and consideration given to airport height restrictions and protection zones. To this extent, the LRT alternative will have no adverse consequences to land use in the airport vicinity.

**Potential Displacements and Business Relocations.** The track of land between 2500 West and 2400 West, from North Temple south to the airport access road, will be purchased to construct the LRT maintenance and storage facility. As a result, six buildings will be displaced (see Figure 5.3-1). Two buildings are vacant storage buildings. One building located on property owned by the Salt Lake City Corporation (nearest the airport access road) has two businesses. These businesses, Precision Air Power and Precision Wire and Telephone, will need to be relocated. The Salt Lake City Corporation, which owns this property, has the option to terminate the two business leases. Therefore, these businesses may not occupy this property at the time of LRT final design and construction. Of the three buildings that are along North Temple between 2500 West and 2400 West, one building is a small restaurant, The Palms AC (property owned by Salt Lake City Corporation); one storage-type building is used by one business; and the other building holds the offices of three businesses (see Figure 5.3-1). The three businesses in the office building and storage type building at 2500 West and North Temple, AV-Tech, Romarco, and Danzas, Inc. will need to be relocated. At the appropriate time, property and business owners will be contacted and business relocation procedures in accordance with the procedures of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 and the Uniform Relocation Act Amendments of 1987 known jointly as the Uniform Relocation Assistance Act, will be followed.

There are four parcels included in the tract of land considered for use as the maintenance and storage facility. As already mentioned, there are six businesses located on three parcels; another parcel contains two vacant buildings. Employment information is available for only one firm, Precision Air Power, which employs between one and nine employees. Based on the building sizes, it is likely that each of the businesses fall into this employment range regarding number of employees. The real property and improvements on the site total $2,097,900 (according to the records of the Salt Lake County Assessor). The assessed valuation for each parcel is summarized in Table 5.3-1.

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Potential Business Relocations

Figure 5.3-1

| Table 5.3-1 Assessed Valuation of Properties in the Maintenance Facility Area | | | | | | | |
|---|---|---|---|---|---|---|---|
| Address | Acres | Owner | Land Assessed Value | Building Assessed Value | Total Assessed Value | Occupant/ Tenant | Parcel Number |
| 20 S 2400 W | 13.03 | SLC Corporation | $971,600 | $137,100 | $1,108,700 | Precision Air Power Precision Wire & Telephone | 15-04-126-002 |
| 2417 W North Temple | 0.85 | SLC Corporation | $14,000 | $58,800 | $72,800 | The Palms AC | 8-33-300-008 |
| 45 S 2400 W | 3.16 | Airport Partners LCC c/o American West Title 5200 S. Highland Dr, #210 SLC, UT 84117 | $320,800 | $207,000 | $527,800 | Vacant | 8-33-300-013 |
| 2445 W North Temple | 0.65 | David Elliott (c/o property address) | $72,800 | $315,800 | $388,600 | AV-Tech Romarco Danzas, Inc. | 8-33-300-006 |

Source: SL County Recorder, SL County Assessor, Wikstrom Economic & Planning Consultants, Inc.

Of the four parcels, two are owned by Salt Lake City Corporation and two are owned by private groups or individuals. The parcels are zoned CC - Commercial Corridor, which allows most commercial uses. There are a number of locations within Salt Lake City and within Salt Lake County that will accommodate small, commercial uses. To the extent that these businesses are airport-dependent, the alternatives available to the businesses for relocation will be confined to the Northwest Quadrant of Salt Lake City. This area is experiencing slow and steady reinvestment and should benefit from the West-East LRT system on North Temple. It is reasonable that alternative locations within the general airport area will be available to these businesses. Therefore, no long-term land use effect is anticipated for any of these potential business relocations.

## 5.3.2 North Temple

**No-Build Alternative**

With the No-Build Alternative, current growth trends and land-development patterns would likely continue. This would mean a continuation of mixed-use development including manufacturing, airport-related business, office park, strip commercial, and residential land uses in the area. Potential for secondary development opportunities on the undeveloped land which increases density or encourages a higher use for the land may or may not occur with the No-Build Alternative.

**LRT Alternative**

LRT, located in the center of the street, does not adversely affect land uses along the street. There may be an indirect effect if the presence of LRT has an impact on traffic circulation and access to adjacent uses.

Existing uses are compatible with LRT, which provides another form of transportation, thus increasing access to the area. LRT offers an opportunity to create a more pedestrian-friendly atmosphere on North Temple because signalized intersections and crosswalks will be constructed where none currently exist, offering enhanced safety to pedestrians crossing this busy street.

This alignment provides access to properties along North Temple: Multi-family apartments, State Department of Environmental Quality, and others at approximately 2400 West; State Department of Natural Resources, UP&L, Holiday Inn and small commercial properties at 1600 West; Utah State Fairpark and the proposed shared park-and-ride facility between 1200 West and 1000 West; and new motel facilities and other potential development at 750 West.

All of these stations are located in areas where existing or proposed development and density can provide support to LRT services and where LRT service can complement development. The park and ride lot across from the Fairpark may stimulate additional development in the area.

### 5.3.3 Downtown

**No-Build Alternative**

With this alternative, the full redevelopment potential of the west downtown area cannot be realized. It is anticipated that development patterns and land uses would change quickly and dramatically because of other improvements in the area and increased accessibility resulting from the removal of the I-15 viaducts.

**LRT Alternative**

Development and redevelopment pressures could have a positive effect on the reuse of the Union Pacific Depot, and afford excellent access to uses, activities, and attractions which may take place in the Gateway Area generally. The current proposal for the area would be enhanced by the presence of an LRT station on 400 West between South Temple and 100 South. This is also one of two locations where there is a link between the North-South LRT line and the proposed West-East LRT line. The proposed West-East LRT station on 400 West across from the Depot is an excellent point of transfer which further increases the attractiveness of the area for redevelopment and reuse.

An additional station at approximately 350 South and 400 West will serve new residential development on Pierpont Avenue (Artspace and other new and proposed development in the area as well as improve access and visibility to Pioneer Park.

The mixed-use, urban neighborhood concept proposed for the Gateway District is ideally suited to transit oriented development (TOD) and supports public transit goals and objectives. The "Gateway District Land Use and Development Master Plan" encourages pedestrian friendly streets, transit oriented development, mixed-use development patterns that support the sense of community and neighborhood, higher density development with an emphasis on housing, and a system of open spaces and trails that encourage pedestrian movement. The stations on 400 West between South Temple and 100 South, and between 300 South and 400 South will serve the emerging Gateway District neighborhood and its population of nearly 12,000 residents anticipated at buildout.

The LRT station just west of Main Street is adjacent to redeveloping blocks in an area which includes the Little America Hotel and its expansion to the east with additional rooms and convention facilities. The new Scott M. Matheson Courts Complex, Federal Courts complex, and the existing parking lots (underutilized parcels) which have excellent redevelopment potential, are all well-served with LRT and are complementary to transit. This station will serve as the key transfer point between the West-East and North-South LRT lines.

### 5.3.4 400 South

**No-Build Alternative**

With the No-Build Alternative, current land patterns would continue. Most of this area is an established mixed-use commercial neighborhood with very little undeveloped land, or incentive for redevelopment.

**LRT Alternative**

The existing land use pattern probably would not change in the short term, except that increased opportunities for secondary development are provided with the transit stations associated with LRT. Many new development and redevelopment projects already underway or planned would be enhanced by access to LRT.

From 400 West to 200 East, the LRT line is a single track alignment running on each side of 400 south. Several LRT stations are proposed:

- The 200 East station can serve employees at the City and County Building, the Metropolitan Hall of Justice block (which includes the Salt Lake City Public Library main branch), and many retail and commercial uses nearby. The Hall of Justice block will be redeveloped in the next few years, providing an opportunity for transit-oriented development to occur. The land uses on the north side of the street are currently in transition as buildings are being remodeled for new uses;

- A station between 600 East and 700 East is adjacent to local and neighborhood shopping and services in a mixed-use setting, including walking access to the Family Center and the Fred Meyer Center. The proposed 4th Street Market on the north side of the street is a redevelopment of an existing single story office complex to commercial uses. Trolley Square, one block to the south, contains retail stores, restaurants, and cinemas. Again, this is development that is complementary and supportive of LRT;

- An LRT station between 800 East and 900 East will serve multi-family apartment and condominium projects, medical offices, and other commercial uses. Near 950 East, three single-family residential structures sandwiched between commercial and high-rise residential uses may experience pressure to change use in the future.

### 5.3.5 University

**No-Build Alternative**

The No-Build Alternative does not solve any of the access problems to the primary land uses in the area - University of Utah, University Medical Campus and VA Hospital, and the possibility of major changes in land use is very unlikely. Development growth in the area would create more demand for convenient and accessible transit. Existing streets and transportation system would continue to be congested, and parking, both on campus and in adjacent neighborhoods, would continue to be a major problem in the area.

**LRT Alternative**
Land uses would not likely change; but development at the University and Medical Center, and increased staff and employment would continue. In addition to the employment and student transportation benefits, the University is a major cultural and sports center in the city. Patrons of these facilities and activities could use LRT and greatly reduce impacts to the nearby neighborhoods at these peak times by reducing traffic and congestion, and demand for on-street parking. The land uses in these areas would generate increased density which is supportive and compatible with LRT.

All of these stations should fit in well with the campus environment.

- A station adjacent to the Field House and Rice-Eccles Stadium on South Campus Drive would serve the University neighborhood. Residential structures immediately west of the parking lot may be affected by buses and LRT accessing the parking lot and station area; however, the use itself is very similar to the current use of the area as a parking lot;

- A station at the intersection of South Campus Drive and Guardsman Way (Central Campus Drive) will offer access to the University's main campus, as well as the Veterans Administration Medical Center;

- The station adjacent to Huntsman Center will serve campus activities and facilities, and special events occurring in the evening and on weekends. A proposed pedestrian bridge across Wasatch Boulevard to Fort Douglas nearby, will focus pedestrian traffic in the vicinity of the station platform;

- The station at the Health Sciences Center will serve patients, staff and visitors to the medical facilities at the University Hospital, Primary Childrens Medical Center, and other medical facilities.

### 5.3.6 Land Use Mitigation
Because there will be no significant changes in land use or zoning as a result of implementation of the LRT Alternative, there is no mitigation required. Relocations will be carried out in accordance with the procedures of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (42 USC. Section 4601, et seq.) and the Uniform Relocation Act Amendments of 1987 (known jointly as the Uniform Relocation Assistance Act).

## 5.4 PARKS AND OPEN SPACE

### 5.4.1 Airport
**No-Build Alternative**
There will be no direct impact on park land and open space.

**LRT Alternative**
There will be no direct long-term impact on park.

### 5.4.2 North Temple

**No-Build Alternative**

There will be no direct impact on park land and open space.

**LRT Alternative**

There will be no direct long-term impact on existing park land. Access to the Fairpark and the Jordan River Parkway will be improved.

### 5.4.3 Downtown

**No-Build Alternative**

There would be no direct impact on park land and open space.

**LRT Alternative**

Although 400 West and 400 South streets are adjacent to Pioneer Park, LRT is in the center of 400 West and will not impact the park. The side-of-street LRT alignment along the south side of the park on 400 South will be constructed within the existing right-of-way and will not impact the park. Moreover, LRT will improve access to the park. Trimming or removing trees along Pioneer Park or Washington Square is not required. The trees along the street-edge are mature and already pruned high, which will allow for LRT overhead facilities, LRT vehicles, and street lighting.

It may be necessary to interface with the proposed continuance of City Creek Park as it winds its way through the Gateway District. This is intended to be a creek corridor, pedestrian trail/urban trail, and bicycle connection between the downtown area and neighborhoods to the west. While the exact alignment of the creek corridor has not yet been determined, it must cross 400 West at some point probably between 200 South Street and North Temple.

### 5.4.4 400 South

**No-Build Alternative**

There would be no impact on park land and open space.

**LRT Alternative**

There would be no direct impact on park land. Eastbound LRT trains on 400 South will pass along the north edge of Washington Square, but there will be no impact to the park as no right-of-way will be taken.

### 5.4.5 University

**No-Build Alternative**

There would be no impact on park land and open space.

**LRT Alternative**

There will be impacts to landscaped areas and street trees along South Campus Drive, Wasatch Boulevard (on the west side of the street) and Medical Drive (on the west side of the street at the golf course). These impacts will be caused by expansion of paved surfaces into currently landscape areas.

### 5.4.6 Parks and Open Space Mitigation

The University of Utah campus is considered part of the State Arboretum of Utah. Consequently, it will be important to minimize as much as possible the impact to trees and landscaped areas, and to mitigate any losses by replacing the trees at a one-for-one ratio which are removed. This will be accomplished by working closely with the University of Utah Campus Facilities planning department and Red Butte Garden and Arboretum.

## 5.5 HISTORIC AND CULTURAL RESOURCES

### 5.5.1 Airport

**No-Build Alternative**

There are no anticipated impacts to historical, archaeological, or cultural resources in this area.

**LRT Alternative**

There are no anticipated impacts to historical, archaeological, or cultural resources in this area.

### 5.5.2 North Temple

**No-Build Alternative**

There are no anticipated impacts to historical, archaeologic or cultural resources in this area.

**LRT Alternative**

Although the alignment passes by Utah State Fairpark, there would be no negative impact to the historic structures or the physical layout of the Fairpark. There are no known impacts to archaeological resources.

### 5.5.3 Downtown

**No-Build Alternative**

There are no anticipated impacts to historic, archaeological, or cultural resources in this area.

**LRT Alternative**

**Historic Structures**. The south and west boundaries of Pioneer Park are formed by 400 West and 400 South, and the proposed alignment passes by the historic Union Pacific Depot. No direct impact to the depot or the park is anticipated as the alignment stays within the existing right-of-way. LRT could create the impetus for renovation and reuse of the depot, which would greatly contribute to the unique character of the area, and benefit the neighborhood and new Gateway District development west of the depot.

The alignment touches the western edge of the Warehouse Historic District. Many of the structures are in need of repair and renovation. The presence of LRT in the area could provide added stimulus for adaptive reuse of historic structures in the area, which would be a benefit and help to preserve the historic character of the area. There should be no impact to the structures or the character of the district.

At the Exchange Place Historic District, the presence of transit would not adversely impact the area and may complement office uses in the historic structures. Electric trolleys were once a part of downtown Salt Lake City. The new system would be quieter and more compatible with urban development.

Several other structures along the alignment are potentially eligible for inclusion in the Historic Register, however, none are affected by the proposed alignment.

**Prehistoric or Historic Archaeological Resources**. Prehistoric or historic archaeological resources may be affected in this area. There is the potential for impacts to previously unidentified archaeological resources within the street right-of-way. Construction will consist of excavation for the track, catenary (power poles), and platform stations in the center of the right-of-way on 400 West and along the sides of the street on 400 South (between 400 West and 200 East). The recent discovery of human remains while excavating along South Temple for the North-South LRT line, and past historic uses in the Pioneer Park area suggest the potential for encountering prehistoric or historic archaeological resources in this area is fairly high. Section 5.5.7, "Historic and Archeological Resource Mitigation," provides details about the process of SHPO coordination in the event such resources are discovered.

### 5.5.4 400 South

**No-Build Alternative**

There are no anticipated impacts to historical, archaeological, or cultural resources in this area.

**LRT Alternative**

The LRT alignment on 400 South passes by the historic City and County Building and Washington Square. The location of tracks along the side of the street should not directly impact the park.

Farther to the east the tracks would pass through the Central City Historic District and the University Historic District. Both of these historic districts are primarily residential in character. Neither is impacted by LRT.

Tenth Ward Square at 400 South and 800 East is listed on both the National Register of Historic Places and the City Register. 400 South is a heavily traveled road with existing traffic conditions. The presence of LRT on this route will not change conditions in the area over existing conditions and will not likely affect historic resources in the area. Potential impacts of traffic and LRT vibrations on this historic resource are discussed in Section 5.11.3.

Other structures are potentially eligible for historic designation, however, none are affected by the proposed alignment.

At this time, there are no known prehistoric or historic, archaeological, or cultural resources in the right-of-way.

### 5.5.5 University

**No-Build Alternative**

There are no anticipated impacts to historical, archeologic or cultural resources in this area.

**LRT Alternative**

As the alignment passes through the University en route to the Medical Center, it goes by Carlson Hall on the corner of Campus Drive and University Street. There are no anticipated impacts to Carlson Hall, a National Register of Historic Places site, since the building is set back over 50 feet from the street.

The route does not enter Fort Douglas but it does pass by the area. None of the historic structures are impacted by the alignment.

At this time, there are no known prehistoric or historic archaeological resources in the area.

### 5.5.6 Historic Archaeological Resources

Throughout the length of the alignment, there is the potential for impact to prehistoric or historic archaeological resources wherever construction activity (i.e. excavation) will occur. Construction will consist of excavation for the track, platform stations, and catenary (power supply poles). Except for locations along 400 South between 400 West and 200 East, and within the University of Utah campus along South Campus Drive, Wasatch Boulevard, and Medical Drive construction will impact landscaped areas.

In light of the recent discovery of human remains in South Temple while excavating for construction of the North-South LRT line, and previous discoveries adjacent to Pioneer Park, it is possible that prehistoric or historic archaeological resources may be encountered during construction of this alignment. These discoveries appear to be most likely in the Gateway District and the west downtown area of Salt Lake City, specifically, along 400 West and 400 South.

In addition to the actual track alignment, there is a proposed maintenance facility located at approximately 2500 West between North Temple and the I-80 ramp, and a proposed park and ride lot located on the south side of North Temple directly across from the Utah State Fairpark. Both of these sites are currently undeveloped, although both have been disturbed by previous use. The likelihood of encountering intact archaeological resources at these locations is therefore considered low.

### 5.5.7 Historic Archaeological Resource Mitigation

The Section 106 documentation for the West-East Light Rail project states that there is "No Effect" on historic structures and "No Adverse Affect" on prehistoric or historic archaeological resources due to the proposed LRT alignment. There is some potential for discovery of archaeological resources. Therefore, prior to the construction, a program for monitoring the site for discovery of potential archaeological resources will be developed. Ongoing coordination with the SHPO will be maintained throughout the duration of the project, and in the event such discoveries are made, the agency official will notify SHPO.

If, during construction of the project archaeological or artifact remains are discovered, the Agency Official shall notify the SHPO at the earliest possible time with details of the discovery. The SHPO shall provide interim comments to the Agency Official within 48 hours of the request and final comments to the Agency Official within 30 days of the request. Procedures outlined in 36CFR 800.11 will be followed by the SHPO and Agency Official in developing a response to the discovery. In addition, an archeological monitoring contractor will be employed during construction. The frequency of and location of monitoring will be developed in consultation with the SHPO.

### 5.5.8 Section 4(f) Resources

A Section 4(f) evaluation must be prepared when a proposed project would cause either the direct use of a Section 4(f) resource or the constructive use of the resource. Section 4(f) resources include park lands, wildlife refuges, conservation areas, wild and scenic rivers and historic structures and districts. These federal requirements result from the U.S. Department of

Transportation Act of 1966. Land acquired from a historic property or a park for project right-of-way would constitute a direct use of a Section 4(f) resource. Excessive noise impacts on a state or national park to the point of impairing recreational activities would constitute a constructive use of Section 4(f) land.

The Section 4(f) resources within the West-East FEIS Corridor are Pioneer Park, Washington Square, the State Fairpark, Union Pacific Station, Exchange Place historic district, the City and County Building, Tenth Ward Square, Carlson Hall, the Fieldhouse (eligible for the National Register), and Fort Douglas. These parks and historic buildings have already been noted in Section 5.4 and 5.5 of this FEIS. As already noted, no direct use impacts will occur as a result of the proposed construction of the West-East LRT project. In addition, analysis was conducted to determine if any constructive use impacts (such as noise, air quality, or lack of pedestrian access) would occur in the study corridor. For example, additional noise and vibration studies were completed at the Exchange Place historic district downtown and the Tenth Ward Square at 400 South/800 East. Analysis results show that no constructive use of any Section 4(f) resource would occur. Therefore, no Section 4(f) evaluation is required as the result of the proposed construction of the West-East LRT project.

Extensive coordination has taken place with the appropriate agencies (e.g., Utah State Historic Preservation Office; Salt Lake City Department of Parks Recreation and University of Utah) throughout the West-East Light Rail FEIS process. This agency coordination is documented in Section 7 of this FEIS.

## 5.6 SOCIO-ECONOMIC IMPACTS

This section addresses potential socio-economic benefits and adverse effects of the two alternatives. In predicting population, dwelling unit and employment growth in the corridor through 2020, the following sources of information were used: Salt Lake City Planning, Community and Economic Development Department, Salt Lake City Downtown Alliance, University of Utah Residential Housing Office, and University of Utah Department of Facilities Planning.

### 5.6.1 Airport

**No-Build Alternative**

The assumptions used in developing the most current socioeconomic projections for the area were did not include major transportation improvements. Therefore, the impact of the No-Build Alternative to neighborhood and businesses approximates the Wasatch Front Regional Council baseline projections for 2020. (In addition, the No-Build Alternative would not incur construction-related impacts or acquire the needed products to complete a light rail transit system, nor the benefits associated with LRT such as Federal funding and induced effects from regional earnings and employment.)

This alternative would not respond to the increasing traffic pressures from downtown to the west in Salt Lake City. Though the population of the airport area is small at present, the estimated annual growth rate of 8.4 percent between 1990 and 2020 far exceeds the growth rate of any other area within the corridor, the city, or the county.

The No-Build Alternative would not serve the growing needs of passengers and employees at the Salt Lake City International Airport, particularly in light of projections that passenger traffic through the airport is expected to double within the next twenty years.

**LRT Alternative**

The LRT alternative would have a positive impact in that it would provide relief for parking shortages for the airport and surrounding area traffic. It would provide an attractive transportation alternative for airport employees and travelers. It would also increase convenience and mobility for air passengers within the corridor. Moreover, LRT and associated planning would focus increased employment and passenger densities within the airport area.

One negative impact would be that six buildings would be displaced between 2500 West and 2400 West, south of North Temple, as noted in Section 5.3.1. This tract of land will be purchased to construct the maintenance and storage facility. In addition, six businesses that currently operate on this tract of land may need to be relocated in accordance to the Uniform Housing and Relocation Act (see Section 5.3.1). Other commercial locations are available within the general airport area. Therefore, no long-term land use impacts are anticipated for any of these potential business relocations.

## 5.6.2 North Temple

**No-Build Alternative**

With the No-Build Alternative, the North Temple area would continue to have the same level of bus transit service. Circulation in the North Temple area is hindered by the barriers imposed by I-15, I-80, and I-215. The No-Build Alternative would greatly hinder development of new and existing commercial entities along North Temple because travelers bypass North Temple when taking the east-west I-80 freeway. In this way, the North Temple area would lose its potential to capture a significant share of the travel market. In turn, other commercial entities would not maximize their potential, and some new businesses would find the area unappealing economically.

**LRT Alternative**

The LRT alternative would have a positive socio-economic effect because LRT will provide needed access between downtown and North Temple neighborhoods and commercial establishments. While the North Temple corridor has developed as "strip" commercial that is very automobile-oriented, this alignment has potential for further transit-oriented commercial development; new businesses, as well as expansion of existing businesses. A North Temple Corridor Economic Revitalization Plan, (prepared in 1994 by Salt Lake Neighborhood Housing Services, but not yet adopted by Salt Lake City) has been recently developed to jumpstart this process.

LRT along this alignment would likely enhance development efforts by providing improved access to retail services, "Power Center" shopping centers, midrange priced restaurants, entertainment centers, theaters and other commercial establishments. LRT along North Temple from the airport to 400 West would support the three main markets that provide economic activity: the daytime workforce of roughly 10,000 people; the surrounding neighborhoods; and recreation, entertainment, tourism, and "small conference" events that occur with the enhancement of the Jordan River Parkway and the State Fairpark.

To the extent that infill development and expansion were to occur, there would be new job opportunities to complement the roughly 10,000 people employed within the North Temple area.

## 5.6.3 Downtown

**No-Build Alternative**

The No-Build Alternative would likely result in a negative impact with increased congestion in downtown and fewer mobility and access options as employment and visitor numbers grow, and parking availability shrinks. As a result, the area's attractiveness as the major commercial and employment center may diminish. In addition, without enhanced public transportation across existing barriers, revitalization and development plans in the Gateway District may not be realized to the extent desired.

**LRT Alternative**

This alternative would have a positive impact downtown through enhanced high-capacity transit for east and westbound downtown commuters should relieve parking pressures and increase access to downtown. Since excessive traffic and a perceived lack of parking currently discourages some downtown customers, ridership of the North-South LRT with a transfer to east-west bound LRT would enhance mobility and access to downtown and downtown businesses. LRT would make downtown more competitive with outlying areas for new business development and could increase employment and commercial activity.

The 400 West alignment from North Temple to 400 South lends great support to the Gateway Project, the plan through which Salt Lake City plans to revitalize the western downtown area. In this context, it is an opportunity to implement transit-oriented development, where mixed uses and diverse activities can be designed to facilitate access and increase ridership to transit stations. The economic benefit to individuals, businesses, the community, and the city could be substantial due to the symbiotic relationship between transit and development.

The Gateway District, at build-out, will add roughly 12,941 residents and 7,395 dwelling units. Over 9.8 million square feet of commercial space will generate an employment increase of around 19,600.

The symbiotic relationship between the 650-acre Gateway District and the proposed LRT line can be summarized as follows: Due to the cost of the capital improvements associated with constructing a LRT line and support facilities, the LRT Alternative would mean a major investment in the Gateway District and much support to the redevelopment of the Gateway District. Indeed, the Gateway District needs to be attractive to investors to be successful. The high level of investment required for the capital improvements associated with LRT serves as a market signal to potential investors that the area is conducive for private investment.

There would be one negative impact downtown. About 10 to 15 small businesses, eateries, and night clubs are located along the LRT alignment downtown and will be the most affected by lack of parking and/or accessibility as a result of LRT implementation. At least one business along this section of 400 South has changed from retail to wholesale clients due to reduced walk-in customers during I-15 and Main Street North-South LRT construction. As a result of working group meetings, several merchants cited potential problems for not only patrons, but also with sending and accepting freight when trucks can no longer park on 400 South in front of stores.

### 5.6.4 400 South/500 South

**No-Build Alternative**

The No-Build Alternative has a negative impact on this area since it does not address the growing traffic congestion in the 400 South area, or the destabilizing impact of increased through-traffic on neighborhoods in the eastern part of Salt Lake's Central City. This alternative does not increase transportation options or mobility and access. The 400 South area also has a growing elderly population who are likely to patronize transit. The No-Build alternative would probably fall short of meeting their transportation needs.

**LRT Alternative**

This alternative would have a positive impact on 400 South/500 South since it would serve the primary retail corridor in the 400 South area that runs along 400 South between State Street and roughly 1100 East. A LRT alignment would provide access for the over 4,300 retail employees who work in this area. However, this is not an area of concentrated employment, but rather dispersed businesses along a strip. It is not likely that mass transit would be a major factor in enhanced employment opportunity along 400 South. Also, because the 400 South businesses are not generally pedestrian-oriented, it is likely that the impact to local businesses' sales due to increased exposure and access provided by LRT would be fairly minimal. The system would, however, provide both customers and employees alike an alternative to driving that could result in less congestion in the area which would support the existing businesses. Most of the land in this area is developed. Future development activities would be reinvestments or redevelopment of low density housing with high density/commercial mixed uses.

There is a fairly sparse population along 400 South, so this LRT line would not directly serve a high density residential population. There is, however, a significant population located one to two blocks to the north that would be able to access the LRT line quite easily.

It has been suggested that this alternative would increase traffic in surrounding neighborhoods because of conflicts between LRT and cars along the route. This is not anticipated to occur since 400 South will continue to have the same number of traffic lanes.

### 5.6.5 University

**No-Build Alternative**

The University activity hub serves tens of thousands of people daily and suffers from access and parking limitations. The No-Build alternative would do nothing to relieve the growing congestion in this area, nor would it address the peripheral negative impact of University-bound drivers who drive through or park in residential neighborhoods to reach their destination.

**LRT Alternative**

The LRT would have a positive impact in the University area because it would provide improved access and mobility for the 13,000 employees and 27,000 students of the University of Utah as well as the employees of and visitors to Primary Children's Medical Center and the VA Hospital, particularly as it would interface with the North-South LRT line. This alternative brings more people to the northeast section of the city without increasing congestion, thereby increasing convenience in getting to and traveling around the University and surrounding areas. The LRT alternative combined with shuttle bus service would also facilitate movement of over 33,000 annual visitors to the Red Butte Arboretum, 800,000 annual visitors to Hogle Zoo, and more than 500,000 annual visitors to This is the Place State Park located on Sunrise Avenue.

The enhanced high-capacity transit to the University would not have a significant impact on the west campus' employment or economic development activities. However, ease of access to the University Health Sciences Center could increase the consumer base and access to health care facilities.

The LRT Alternative, which will enhance access to Research Park via a bus shuttle, could help stimulate the build-out of the remaining acreage from the current 5,200 employees to the projected 7,000 employees. As a result, overall economic activity would also be stimulated.

### 5.6.6 Socio-Economic Mitigation

The implementation of the West-East LRT system would have positive socio-economic impacts throughout the corridor, therefore no mitigation measures are proposed. Short-term negative impacts could affect downtown property and business owners as a result of LRT construction. Mitigation measures to minimize short-term construction impacts are addressed in Section 5.19.

## 5.7 ECOSYSTEMS

This section describes potential environmental impacts to vegetation, wildlife/fisheries, and threatened and endangered species by each of the alternatives. The Utah Division of Wildlife Resources regulates impacts to wildlife populations. The U.S. Fish and Wildlife Service must determine if any of the alternatives would have any impact to plants and animals listed under the Endangered Species Act or their respective critical habitats.

### 5.7.1 Vegetation

The No-Build Alternative would not create any impacts to vegetation.

Under the LRT alternative, potential impacts of the proposed West-East Light Rail Transit Project to vegetation resources include: 1) permanent conversion of vegetated areas to light rail facilities; 2) temporary removal of vegetation resources during construction; and 3) changes in storm water runoff with indirect effects on vegetation resources. Construction impacts to vegetation are detailed in Section 5.19, "Summary of Construction Impacts." Specific potential impacts, (not including construction-related impacts,) of the project to vegetation resources include the following:

**Direct Impacts**

Within the LRT right-of-way, all vegetation resources will be permanently converted to project facilities. The acreages of affected vegetation types are listed in Table 3.6-1 in the Affected Environment section. Losses of area supporting wetland vegetation types (marsh, wet meadow, common reed stands) will be compensated by mitigation required by the U.S. Army Corps of Engineers. Some street trees will likely be removed as a result of project construction on the University campus, which is an Arboretum. The exact number of trees to be removed is 237 (worst case scenario). These trees will be replaced through landscaping associated with the project.

**Indirect Impacts**

The West-East project will increase the amount of impervious area within the transit corridor, with subsequent increases in runoff volumes. On the western end of the West-East Corridor, much of the area supporting vegetation resources is currently subject to storm water runoff from adjacent roadways. With the construction of impervious transit facilities within the West-East Corridor, storm water runoff to adjacent vegetation resources will increase. With decreased size of the vegetated area and increased storm water runoff, these adjacent vegetation resources are likely to be subject to wetter conditions than are currently present. Although wetter conditions may result in changes in dominant plant species within both wetland and upland plant communities, such changes are not likely to be negative. In the case of the weedy upland meadow areas, increased availability of water may produce a change to more perennial and less weedy plant species.

**Vegetation Mitigation**

Mitigation of vegetation impacts will consist of restoration or replacement of vegetation that has been eliminated by construction. Impacts upon wetlands will be compensated under the jurisdiction of the US Army Corps of Engineers. A landscaping plan will be created for this project to address the replacement of vegetation. Trees in landscaped areas on the east end of the corridor will be replaced at a ratio of one-for-one as part of the landscaping on the university campus and surrounding areas.

### 5.7.2 Wildlife

**No-Build Alternative**

No long-term impacts to vegetation, fisheries, and threatened and endangered species would occur under the No-Build Alternative. However, under the current transportation system, it is possible that road kills will likely increase over time in correlation with the increase in road use by automobiles. Increased traffic would subsequently heighten noise production, which may disturb wildlife utilizing adjacent habitats. This traffic may also act as a visual barrier between perching avian predators and terrestrial prey, thus decreasing the efficiency of predation and protection.

**LRT Alternative**

**Direct Impacts**

The proposed project will directly affect wildlife primarily through habitat. Habitat destruction along the corridor will be permanent as the completed light rail line will have minimal habitat value to wildlife. General disturbances to wildlife will occur during construction and during operation of the light rail. Disturbance will be greatest during construction as wildlife on adjacent lands will likely habituate to the light rail traffic during normal operations. Also, the light rail may provide a small buffer for wildlife from the adjacent highway.

Loss of wetland habitats will be a direct impact to wildlife. The loss of these wetland functions will be mitigated. It is not expected that the project will substantially reduce the value of adjacent wildlife habitat because much of this habitat already of relatively low value. As a result, the overall adverse effect on wildlife populations in the area should be reduced.

**Indirect Effects**

Indirect effects of the project to wildlife include factors that reduce the value of adjacent wildlife habitat due to project construction or operations. This project reduces indirect effects by placing the light rail corridor along existing roads and highways as opposed to placing the route through intact habitat blocks. Again, it is not expected that the project will substantially reduce the value of adjacent wildlife habitat because much of this habitat is already of relatively low value.

Indirect effects of the project will include the reduction in the value of adjacent uplands due to filling (and thus reducing the size) of some wetland areas. In addition, some wetland areas will be reduced in value due to the reduction in size. Noise and activity during construction will minimally reduce the value to adjacent wildlife areas, but this should abate once operations commence.

**Mitigation of Impacts to Wildlife**

Impacts to wildlife could be reduced during construction by conducting filling and initial grading activities along the west portion of the corridor during the non-breeding season (late-August to mid-March). In addition, the trees could be removed in the early spring (February-March) or late summer/fall (late August-November) to minimize impacts to birds using the trees for cover in winter or nesting.

### 5.7.3 Threatened and Endangered Species

As noted above in Section 3.6.3, the project area does not contain habitat listed as critical or sensitive for either the bald eagle (*Haliaeetus leucocephalus*, threatened) or the peregrine falcon (*falco peregrinus*, endangered), which are the two threatened or endangered species that could be present in the project area. The No-Build Alternative would not have any effect on either species as no new construction would occur. It is very unlikely that the LRT Alternative would have an adverse impact on either of these species given the lack of habitat in the study area. Therefore, no specific mitigation for Threatened or Endangered Species is warranted.

## 5.8 WETLANDS

This section evaluates potential impacts of the proposed LRT facility and of the No-Build Alternative on wetlands. Any impacts to wetlands, including short term, would require a Section 404 Permit under the Clean Water Act. The U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service and the State of Utah Department of Natural Resources will require involvement in determining appropriate measures to mitigate impacts on wetlands.

Section 404 permits often require mitigation, restoration, or creation of wetlands in an area able to support wetland ecology for affected wetlands. Mitigation, on-site or off-site, can involve removal of waste materials, grading of soil to enhance wetland hydrology, planting or seeding with wetland plants, or a combination of these activities. Appropriate mitigation could also take the form of a withdrawal from a mitigation bank created for these purposes.

### 5.8.1 No-Build Alternative

Under the No-Build Alternative, no action would be taken beyond the existing and committed transportation system. No wetlands should be affected other than current impacts from existing infrastructure.

### 5.8.2 LRT Alternative

Construction of the West-East Light Rail Transit project will result in the discharge of fill material into jurisdictional wetlands. In addition, there will be indirect wetland impacts in areas where wetland hydrology will be permanently altered. As described above in Sections 3.6.1 and 3.7, all wetlands in the study area are located in the western portion of the study area. Figures 5.8-1 through 5.8-5 show the impacted wetland areas.

The total acreage of wetlands that will be filled by the project (because they are within the LRT alignment) includes 3.19 acres, which include 0.31 acres of marsh, 0.93 acres of common reed, and 1.95 acres of wet meadow. Included in the acreage to be affected are areas qualifying as waters of the United States, which will be subjected to the same types of project-related impacts: 0.69 acre of open water and 0.08 acre of aquatic bed.

Indirect impacts are expected to wetlands as well. These are areas of jurisdictional wetland that are located between the LRT corridor and the Interstate 80/SLCIA access roads. While the LRT project would not formally require the filling or direct acquisition of these areas, it needs to be recognized that they would constitute a very narrow strip of wetlands between LRT fill and highway fill, and it is likely that they will be adversely affected by construction activities and/or changes in hydrology resulting from the project.

The areas that will be impacted indirectly in such a manner are: 0.24 acres of marsh, 0.31 acres of common reed, and 1.15 acres of wet meadow. Total impacts to wetlands include 0.55 acres of marsh, 1.24 acres of common reed, and 3.1 acres of wet meadow, for a total of 4.89 acres.

There are areas of unvegetated playa that are located in close proximity to the corridor but will not be directly impacted.

Since the area of jurisdictional wetlands that will be potentially impacted by the project exceeds three acres, an individual permit will be required for the project under Section 404 of the clean water act. The U.S. Army Corps of Engineers has expressed a willingness to consider the exchange of wetland mitigation credits from an established wetland mitigation bank for the wetland areas to be impacted by the transit project. A specific proposal to obtain the necessary wetland mitigation credits from a wetland mitigation banks whose service area includes the proposed transit corridor has been included in the application for the Section 404 permit.

### 5.8.3 Mitigation

The area to be mitigated includes 3.1 acres of wet meadow, 0.55 acre of marsh, and 1.24 acres of common reed (*phragmites australis*) that qualifies as wetland, as already stated. According to the U.S. Army Corps of Engineers, the common reed area can be mitigated as either marsh or wet meadow. As a result, the required mitigation includes either 4.34 acres of wet meadow and 0.55 acre of marsh, or 3.1 acres of wet meadow and 1.79 acres of marsh. The two mitigation bank options include the Inland Sea Shorebird Reserve operated by Kennecott Copper Company and the Rainey Mitigation Bank operated by Diversified Habitats, L.L.C. Their requirements are slightly different with respect to reserving mitigation credits for use on the project. A mitigation ratio of 1 acre to 1 acre has been established. UTA and WFRC have agreed to purchase mitigation credits from ISSR.

The Inland Sea Shorebird Reserve (ISSR) has the mitigation credits required by the West-East LRT Project available immediately. ISSR would complete the Habitat Unit Calculation Form to submit to the Corps once an agreement had been reached. The cost for mitigation would be approximately $16,000 to $20,000 per acre. A Section 404 permit will be issued with a condition requiring finalization of the the mitigation agreement and designation of specific acres as mitigation prior to initiation of construction. The cost for mitigation at RMB would be $15,000 per acre.

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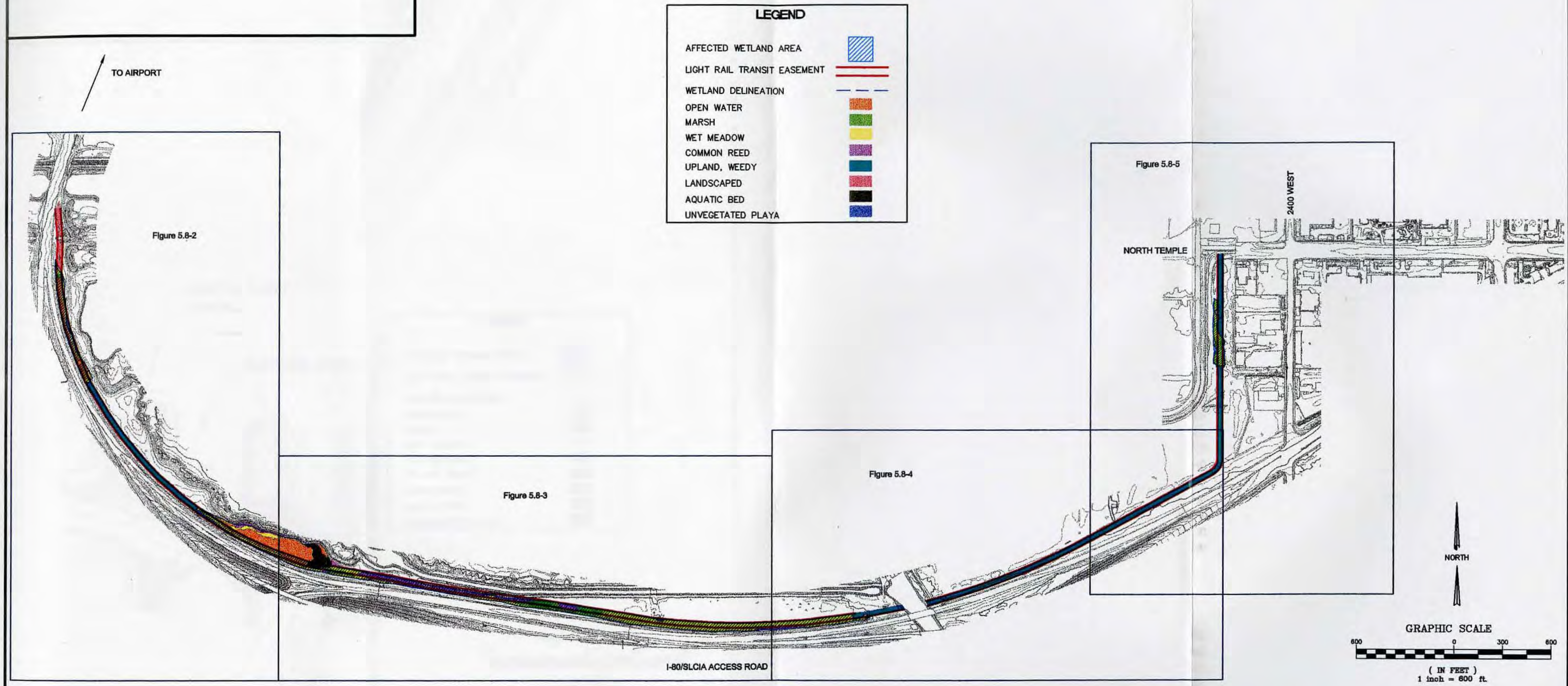
Property Owner:
Salt Lake City International Airport

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# West-East Corridor FEIS Impacted Wetlands/ Vegetation - Full View

Figure 5.8-1

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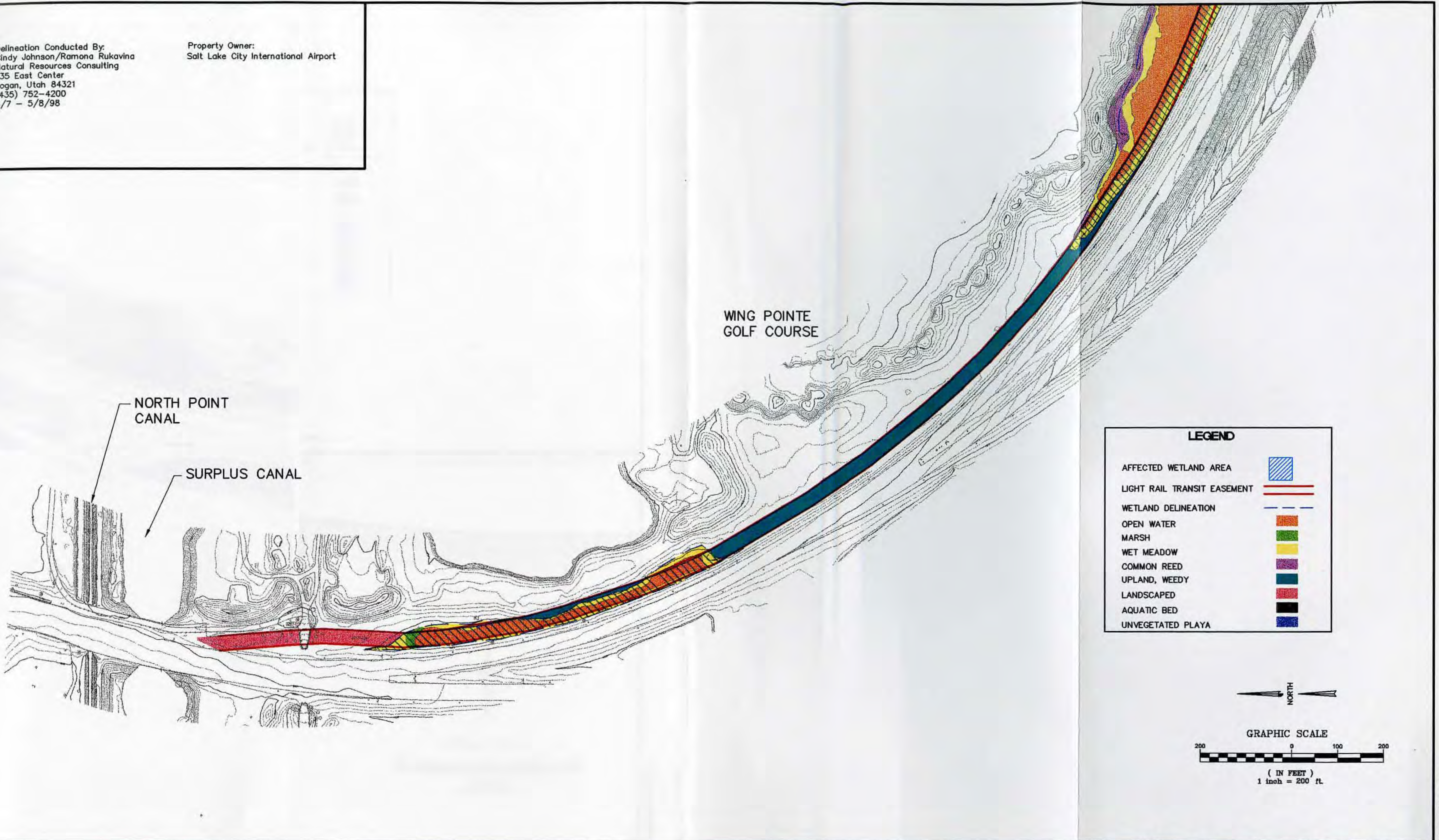


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# West-East Corridor FEIS
## Impacted Wetland/Vegetation Areas
## Map 1 of 4

Figure 5.8-2

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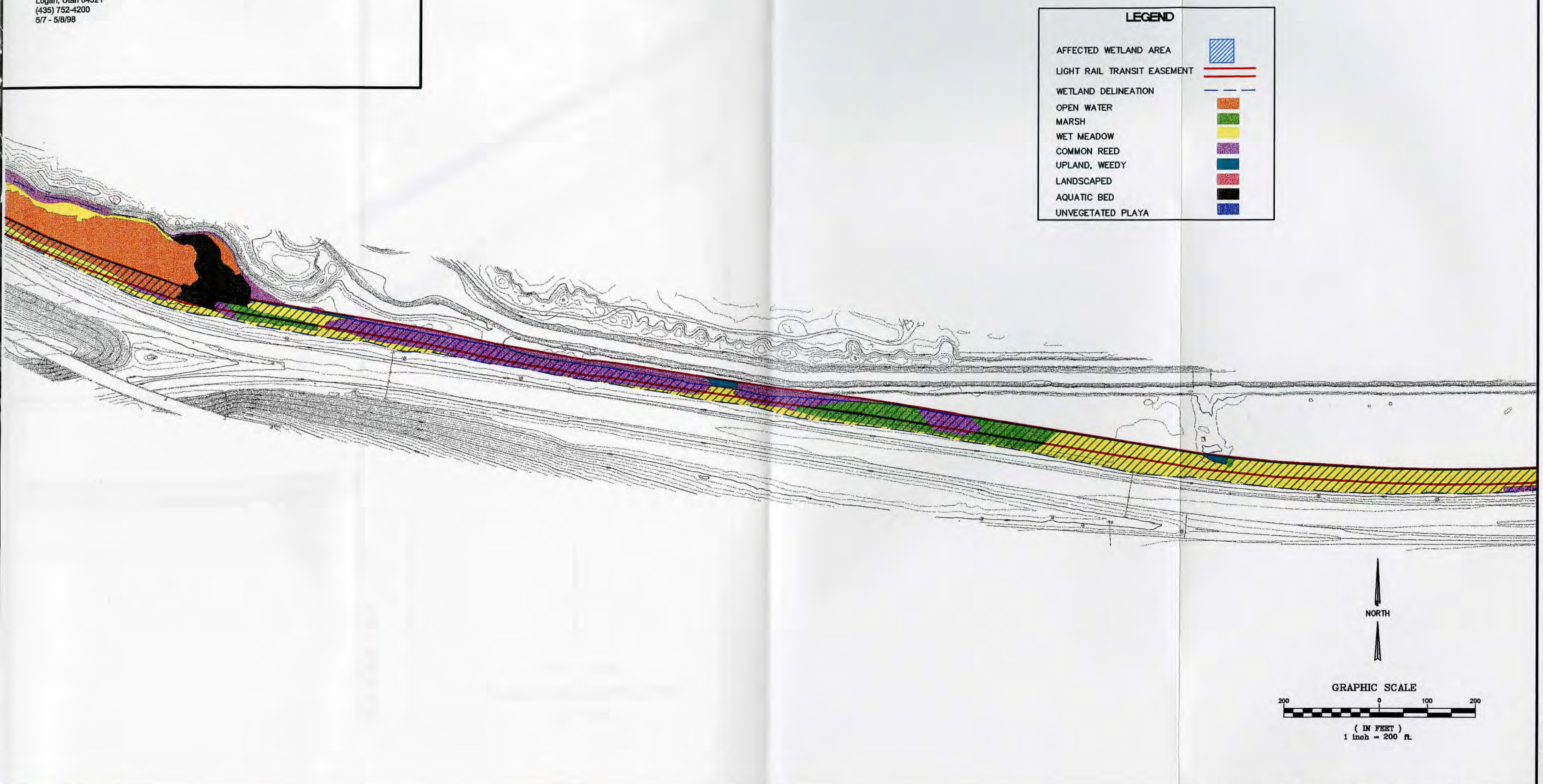


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# West-East Corridor FEIS
## Impacted Wetland/Vegetation Areas
## Map 2 of 4
Figure 5.8-3

Impacted Wetland/Vegetation Areas

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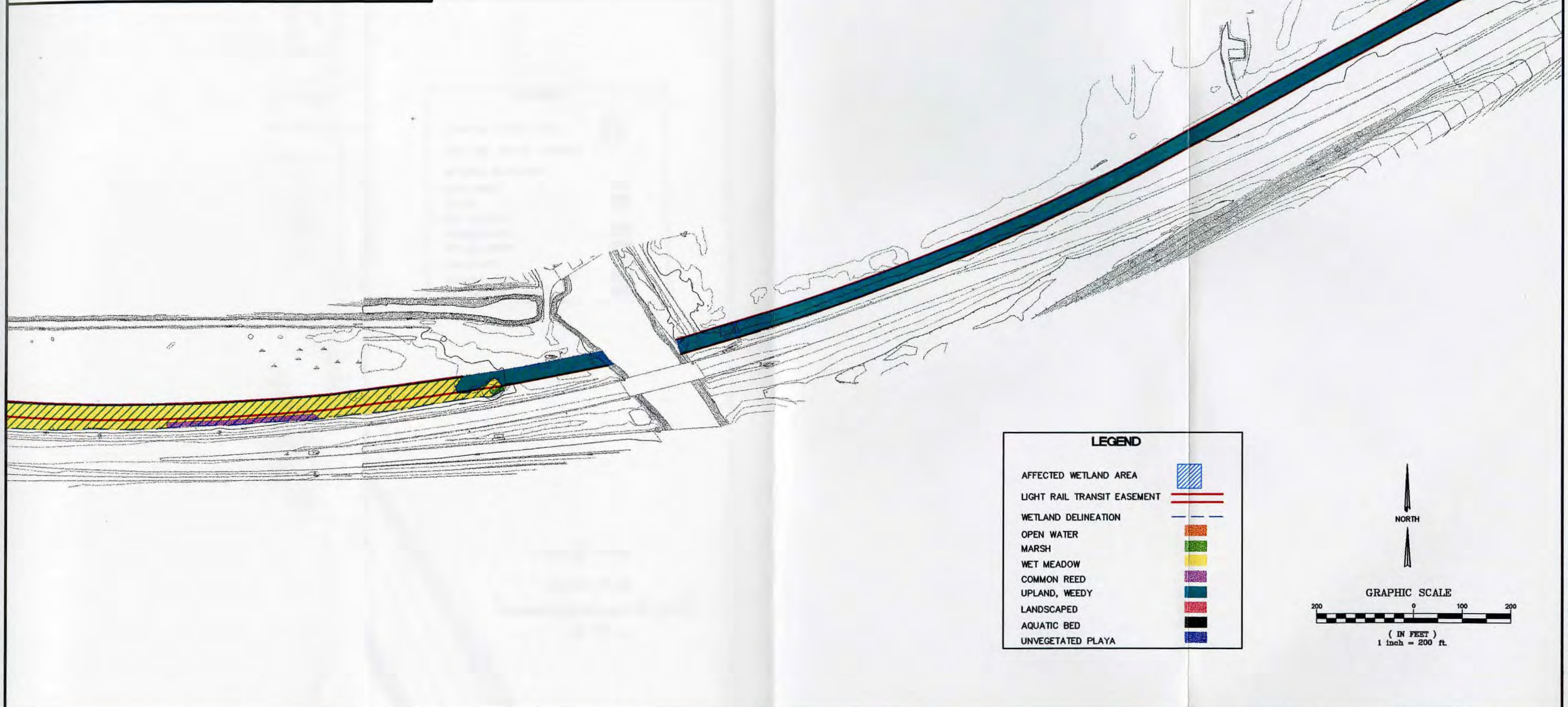


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# West-East Corridor FEIS
## Impacted Wetland/Vegeation Areas
## Map 3 of 4

Figure 5.8-4

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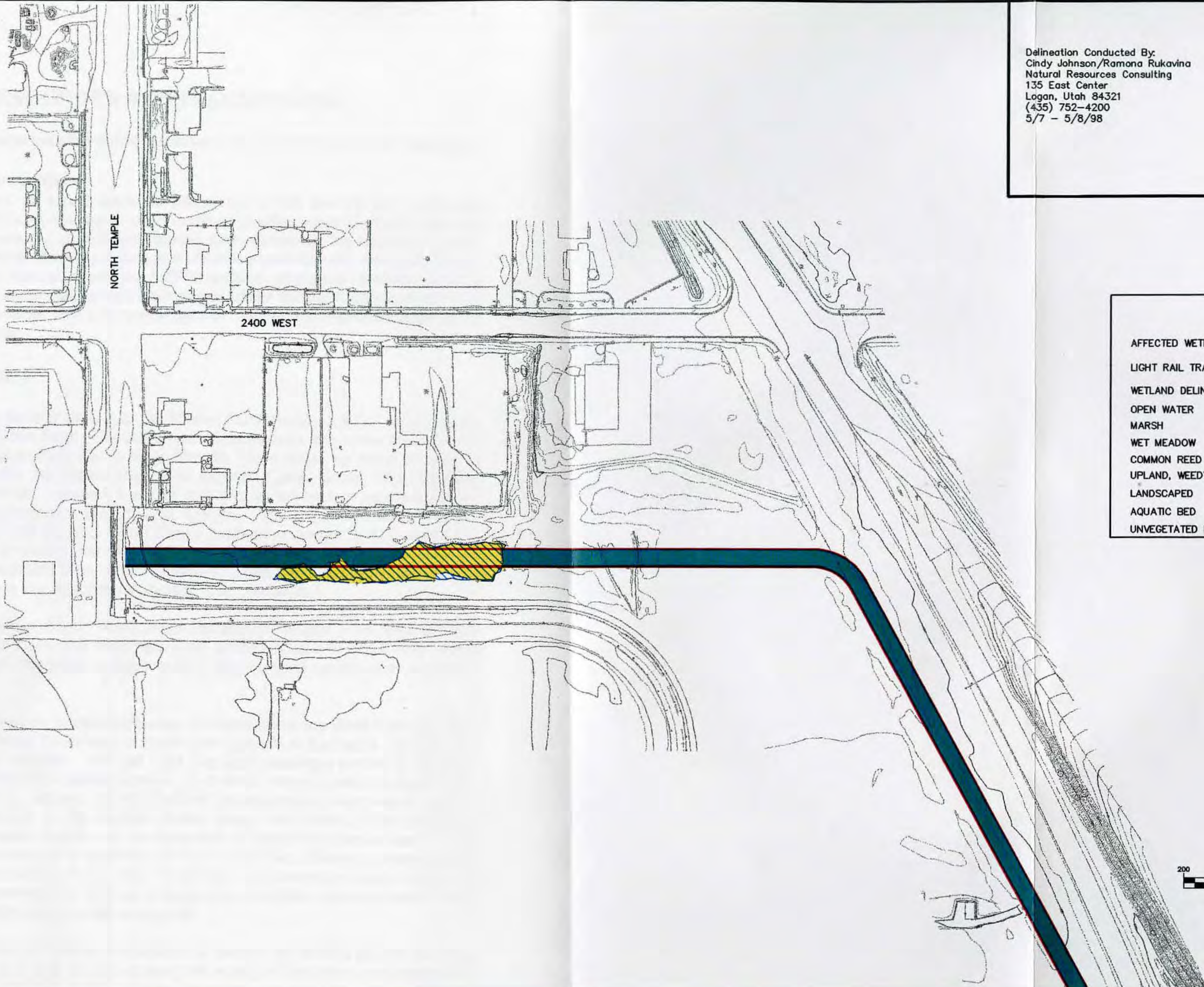


**LEGEND**

| | |
|---|---|
| AFFECTED WETLAND AREA | |
| LIGHT RAIL TRANSIT EASEMENT | |
| WETLAND DELINEATION | |
| OPEN WATER | |
| MARSH | |
| WET MEADOW | |
| COMMON REED | |
| UPLAND, WEEDY | |
| LANDSCAPED | |
| AQUATIC BED | |
| UNVEGETATED PLAYA | |

NORTH

GRAPHIC SCALE

200 0 100 200

( IN FEET )
1 inch = 200 ft.

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# West-East Corridor FEIS
## Impacted Wetland/Vegetation Areas
## Map 4 of 4

Figure 5.8-5

Impacted Wetland/Vegetation Areas - Map 4 of 4

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# 5.9 WATER RESOURCES AND FLOODPLAINS

This section describes the impacts the alternatives would have on water resources and floodplains.

## 5.9.1 No-Build Alternative

Under the No-Build Alternative, no action would be taken beyond the existing and committed transportation system. The No-Build Alternative would continue to affect water quality through the runoff of contaminants from existing streets and parking lots. However, the difference in the volume of contaminants reaching receiving drainage from these sources are non-quanitfiable. When comparing the No-Build Alternative with the LRT Alternative, all that can be determined is that there would be more pollutants distributed from vehicles under No-Build than from the LRT Alternative, as LRT would reduce VMTs to some extent. Under the No-Build Alternative, floodplains would not be affected.

## 5.9.2 LRT Alternative

**Direct Impacts**

The LRT alignment crosses the North Point Canal, the Surplus Canal (twice), the City Drain (twice), the Brighton Canal, and the Jordan River. The alignment will not require any roads or bridges to be expanded east of the transition from I-80 to North Temple. As a result, no direct impacts to water resources associated with the Jordan River, the Brighton Canal, or the City Drain are anticipated. West of that transition, however, the road and bridges will have to be expanded by approximately 30 feet to accommodate the light rail system. This expansion will affect the crossings of the Surplus Canal and the North Point Canal, but not the Jordan River or any other natural water courses. The proposed transit corridor will also impact two small ponds and jurisdictional wetlands located adjacent to the airport access road and in the vicinity of the west end of North Temple. Those impacts are described in Section 5.8, "Wetlands."

Direct impacts of project implementation to water resources and floodplains associated with the Surplus Canal and North Point Canal are expected to be temporary and to occur only during construction. Those impacts are described in Section 5.19, "Summary of Construction Impacts."

**Indirect Impacts**

In addition to temporary direct impacts to water resources and floodplains, the West-East Light Rail Transit Project may slightly increase the amount of impervious area within the transit corridor, with subsequent increases in runoff volumes. The Salt Lake City storm drainage system is not likely to be significantly affected by these increased volumes. As a result, storm runoff management is expected to be similar to current conditions. Storm runoff will be captured in underground culverts or aboveground drainages placed in the median and/or along both sides of the proposed expansion. Existing sedimentation basins will be expanded to accept additional runoff. The detention basins will retain the majority of sediment in storm runoff and thereby preserve water quality of all drainages that traverse the project area. In addition, site planning of station sites and parking areas will incorporate overland flow and use of vegetation to mitigate increased storm water runoff and also to enhance water quality of surface runoff.

The implementation of West-East LRT project is expected to reduce the amount of cars traveling within the corridor. This will have a positive impact upon the quality of the water resources within the project area as a result of a reduction in oils, greases, and heavy metals associated with runoff from areas subject to motor vehicle travel.

### 5.9.3 Water Resources and Floodplains Mitigation

Best Management Practices will be used during construction to mitigate direct impacts. As part of constructing the LRT line, catch basins and storm water drain pipes will be replaced as needed, which will improve the stormwater flow.

### 5.9.4 Regulatory Authority over Water Resources and Floodplains

In response to the 1987 reauthorization of the federal Clean Water Act, the U.S. Environmental Protection Agency (EPA) instituted National Pollutant Discharge Elimination System (NPDES) permitting program for urban storm drainage systems. These permits are required in urban areas with populations greater than 100,000 persons. In Utah, these permits are administered through the Utah Department of Environmental Quality as Utah Pollutant Discharge Elimination System (UPDES) systems. Permits are currently required on storm water outfalls that are 36 inches in diameter or greater, drainages in excess of 50 acres, or discharges greater than two cubic feet per second (cfs). This project may be required to obtain a UPDES permit if one of these criteria is met.

Under UPDES, Salt Lake City is required to obtain a Municipal Permit for storm water discharge and to report results of storm water testing to the State of Utah. The permit includes requirements for public education, implementation of Best Management Practices (BMPs) and efforts to improve the quality of storm water discharges. Such practices include erosion control during construction, in-line oil/water separators for runoff from parking areas, sediment traps prior to discharge, measures to control litter entering storm drains, and efforts to reduce use of herbicide, pesticide, and fertilizer. As a user of the Salt Lake City storm water system, the West-East LRT project will incorporate BMPs for both short term (construction phase) and long term protection of storm water quality. Under the same program, construction activities disturbing more than five acres are required to obtain an UPDES permit for storm water discharge.

Both the NPDES and UPDES permits will be applied for and obtained prior to construction, as part of the project design. In addition, the transit corridor, during both construction and subsequent operation, will be managed in such a way as to ensure ongoing compliance with R317, Utah Administrative Code, Standards of Quality for Waters of the State, which contains minimum water quality standards for the potentially affected public waters.

Any planned crossing or modification to a stream, river, or creek bank requires a permit from the State of Utah under the Stream Alteration Act. This legislation provides coverage under a statewide general permit from the U. S. Army Corps of Engineers (Corps) to fulfill requirements of Section 404 of the Clean Water Act. A stream alteration permit will not be required for the transit project since no alteration of natural water courses (i.e., the Jordan River) will occur. A Section 404 Permit will be required to authorize the discharge of fill material into wetlands within the project corridor. This permitting process is discussed in the section of this report that addresses wetland resources.

No Sole Source Aquifers subject to Section 1424(e) of the Safe Drinking Water Act (42USC300f et. Seq.) occur within the proposed corridor for the West-East LRT project. The Source Protection Act for one well (SLC-18) subject to the Wellhead Protection Program (Section 1428, PL99-339, June 19, 1986) is located within the proposed project corridor (see Figure 3.8-1). Project activities within the Source Protection Area (University of Utah campus) will be subject to Section 21A.34.060 of the Salt Lake City Code (passed by the City Council on December 1, 1998) which requires groundwater source protection.

Floodplains are mapped by the Federal Emergency Management Agency. Any modification of a floodplain or construction within a floodplain is governed by Salt Lake County code 19.74 (Floodplain Hazard Regulations). These regulations call for special approval for work within the flood plain and outline building methods, materials, minimum floor elevations, flood-proofing, and structural requirements. The applicant must also ensure that the flood-carrying capacity of the watercourse is not diminished.

# 5.10 MINERAL RESOURCES

## 5.10.1 No-Build Alternative

No adverse impacts are anticipated since no action would be taken.

## 5.10.2 LRT Alternative

Mineral resources locally present within or near the West-East Corridor include potential good quality sand, gravel, and building stone, which have been mined in the area at various times in the past. The mineral and other resources within the corridor include potential common clay resources and natural gas. In general, these potential resources are inaccessible due to urbanization or are not economically viable. Therefore, there would be no impacts to mineral resources with the LRT Alternative.

## 5.10.3 Mineral Resources Mitigation

No mitigation measures are required since no adverse impacts are anticipated.

# 5.11 NOISE AND VIBRATION

This section compares the noise impacts of the No-Build LRT Alternatives. A noise impact assessment was conducted to quantify the extent of expected impacts and to identify feasible mitigation options where necessary. The analysis was conducted in accordance with the procedures contained in the Federal-Aid Highway Program Manual (FHWA 1982a) and the Federal Transit Administration publication, Transit Noise and Vibration Impact Assessment (USDOT, April 1995).

## 5.11.1 No-Build Alternative

The No-Build Alternative's infrastructure would be very similar to that of the present. Traffic volumes in the study area are expected to increase at a rate of 3 percent per year for this alternative, through the year 2020. Under the No-Build Alternative, the most substantial project in the study area is the I-15 reconstruction project. Other projects include transit route modifications and scheduled STIP projects. One committed improvement is the North-South LRT alignment project which is to be operational by the year 2000. The noise impacts on the North-South LRT alignment project are expected to be similar to those for the West-East LRT project, as both projects are bound by mainly commercial and industrial land use. Moreover, the I-15 and STIP projects' impacts and the North-South LRT construction and operational impacts would occur regardless of any west-east transportation improvements.

### 5.11.2 LRT Alternative

Under the LRT Alternative, the West-East LRT system would be operational by the year 2001. The main sources of noise from the operation of this proposed project will be LRT vehicles along with roadway traffic (with projected five percent trip reductions in vehicular traffic) along the West-East corridor. Receptors along the light rail alignment will experience noise from wheel-track interaction and various cooling fans and HVAC equipment. Receptors near stations will experience noise from bus and automobile traffic and LRT warning devices (horns and bells.) The major sources of construction noise will come from the use of diesel-powered construction equipment along the LRT alignment and at station locations.

For the purposes of this FEIS, a generally significant noise or vibration impact is defined as:

- An exceedence of the Federal Highway Administration (FHWA) NAC criteria (see Table 5.11-1) for transit and roadway alignments;

- An exceedance of the Federal Transit Administration (FTA) impact criteria (described Table 5.11-2) for transit and local street alignments.

**Description of Impact Assessment**

The degree of noise impact resulting from this project depends on the noise levels produced, the location of sensitive receptors, and existing or ambient levels. The following sections briefly describe these components, as well as applicable noise criteria. Ambient noise and vibration levels are discussed in Section 3.11 of this FEIS.

Noise levels were predicted from LRT vehicles, Park-and-Ride and LRT stations, and automobile and bus traffic accessing the stations. Noise from LRT vehicles and stations was predicted in terms of the hourly $L_{eq}$ noise level metric . FTA noise source reference levels were adjusted using project-specific operational information to predict noise levels at receptor locations. Predictions of noise from stations were based on the 20 year total build-out conditions. Noise from traffic was predicted for the present, No-Build, and LRT Alternative conditions at representative locations along the corridor using the Federal Highway Administration's noise prediction model. Vibration levels were predicted from both LRT vehicles and freight rail trains. FTA generalized vibration levels were adjusted using project-specific operating parameters and local geographical conditions.

**Sensitive Receptors**

Approximately 20 locations were chosen as representative of noise and vibration-sensitive receptors along the West-East LRT alignment and near LRT stations. Nearby residences, motels, hotels, public buildings, and parks have been included in the assessment. (See Figure 3.11-2, Ambient Noise Measurement Sites.)

**Applicable Noise Standards**

Noise control regulations exist on the federal, state, and local levels. On the federal level, no regulations stipulate absolute noise levels that must be met by a project of this type. The FTA has, however, drafted noise standards for LRT systems that, when met, are designed to result in an acceptable community noise environment. The FTA criteria are presented in Table 5.11-2. Background noise levels and predicted project noise levels together determine the degree of impact at a given receptor location. During the ambient noise measurement survey, the lowest measured $L_{eq}$ along the LRT alignment was 60 dBA at the University street residences. From Table 5.11-2 , this ambient level corresponds to an impact condition when the project $L_{eq}$ noise level reaches 58 dBA or more, resulting in a combined noise level of 62 dBA or greater, which would be 2 dBA or more above the ambient level at the lowest measured site. Therefore, an impact would occur when the predicted combination of LRT and traffic noise at this quietest receptor site is an Leq of 57 dBA or greater.

The impact from projected light rail and vehicular traffic noise was assessed as follows. Freight rail and roadway traffic noise currently exists in the alignment and would only be altered as a result of the LRT project. The use of the FHWA NAC criteria in Table 5.11-1 requires accurate measurement of present traffic noise and prediction of future traffic noise levels. Another method of impact prediction, which requires predicting the change in these noise levels, also has been used for this assessment. The criteria shown in Table 5.11-2 were used to judge the impact of noise level increases. Noise mitigation options are required for combined noise increases of greater than those in Table 5.11-2.

Locally, Salt Lake City has enacted community noise regulations. Vehicles operating within a public right-of-way, however, are exempt.

**TABLE 5.11-1**
**FHWA CRITERIA FOR NOISE ABATEMENT**

| Activity Category | Noise Abatement Criteria (dBA) $L_{eq}$ | Description of Activity Category |
|---|---|---|
| A | 57 (Exterior) | Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to serve its intended purpose. |
| B | 67 (Exterior) | Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals. |
| C | 72 (Exterior) | Developed lands, properties or activities not included in Categories A or B above. |
| D | — | Undeveloped lands. |
| E | 52 (Interior) | Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditorium. |

Source: U.S. DOT, FHWA, Federal Aid Program Manual, Volume 7, Section 7, Section 3, Procedures for Abatement of Highway Traffic Noise and Construction Noise, Washington D.C., May 14, 1976 (Revised Version in Federal Register, Vol. 47, No. 131, P. 29653 Thursday, July 8, 1982).

| Table 5.11-2<br>FTA Guidelines for the Significance of Noise Impacts<br>Leq, dBA | | | |
|---|---|---|---|
| Existing Noise Exposure | Allowable Project Noise Exposure | Allowable Combined Total Noise Exposure | Allowable Noise Exposure Increase |
| 45 | 51 | 52 | 7 |
| 50 | 53 | 55 | 5 |
| 55 | 55 | 58 | 3 |
| 60 | 57 | 62 | 2 |
| 65 | 60 | 66 | 1 |
| 70 | 64 | 71 | 1 |
| 75 | 65 | 75 | 0 |

Source: U.S. DOT, FTA, April 1995

**Applicable Vibration Standards**

FTA has developed acceptable limits for vibration and vibration-induced noise. These limits are designed to minimize annoyance caused when buildings are set into motion, to minimize the disruption of vibration-sensitive manufacturing and research processes, and to prevent damage to structures. These criteria, shown in Table 5.11-3, were used to assess vibration impacts.

| Table 5.11-3<br>Ground-Borne Vibration and Ground-Borne Noise Impact Criteria | | | | |
|---|---|---|---|---|
| | Ground-Borne Vibration Impact Levels | | Ground-Borne Noise Impact Levels | |
| Land Use Category | Frequent[a] Events | Infrequent[b] Events | Frequent[a] Events | Infrequent[b] Events |
| Category 1: Buildings where low ambient noise and/or vibration is essential for interior operations | 65 VdB | 65 VdB | -- | — |
| Category 2: Residences and buildings where people normally sleep. | 72 VdB | 80 VdB | 35 VdB | 43 VdB |
| Category 3: Institutional land uses with primary daytime use. | 75 VdB | 83 VdB | 40 VdB | 48 VdB |
| Vibration Damage Criteria | Buildings = 100 VdB | | Historic Building=95 VdB | |

Source: U.S. DOT, FTA, April 1995

Notes: a More than 70 vibration events per day.
b Fewer than 70 vibration events per day.
c Vibration level is in VdB, based on velocity, relative to 1 microinch/second

## VIBRATION DATA

Table 5.11-4 provides the "root mean square" (rms) building damage and perception threshold criteria for comparison with measured data. In Section 3.11, Tables 3.11-3 and 3.11-4 showed the measured rms maximum and average vibration data, respectively, and the various spectral and overall vibration criteria.

| Table 5.11-4 RMS Building Damage and Human Perception Vibration Thresholds | | | | |
|---|---|---|---|---|
| 1/3 Octave Band Center Frequency | Standard Building Damage Threshold | Sensitive Building Damage Threshold | Ancient Ruins Damage Threshold | Human Perception Threshold |
| Hz | VdB* | VdB* | VdB* | VdB* |
| *Overall Level* | *109.0* | *103.0* | *95.0* | *65.0* |
| 4 | 101.6 | 95.6 | 87.6 | 57.6 |
| 5 | 100.5 | 94.5 | 86.5 | 56.5 |
| 6.3 | 99.2 | 93.2 | 85.2 | 55.2 |
| 8 | 98.1 | 92.1 | 84.1 | 54.1 |
| 10 | 97.5 | 91.5 | 83.5 | 53.5 |
| 12.5 | 97.2 | 91.2 | 83.2 | 53.2 |
| 16 | 96.9 | 90.9 | 82.9 | 52.9 |
| 20 | 96.7 | 90.7 | 82.7 | 52.7 |
| 25 | 96.6 | 90.6 | 82.6 | 52.6 |
| 31.5 | 96.5 | 90.5 | 82.5 | 52.5 |
| 40 | 96.3 | 90.3 | 82.3 | 52.3 |

Source: U.S. DOT, FTA, April 1995

## 5.11.3 LRT Alternative Results

**Operational Noise**

In general, noise impacts from the proposed project are expected to be limited. A portion of the West-East Corridor has active freight rail operations, with approximately 90 freight trains passing through each day. As a result, ambient noise levels in that portion of the alignment are relatively high, which reduces the impact of noise from the relatively quiet LRT vehicles in that area. Furthermore, much of the LRT alignment is lined by industrial and commercial facilities.

Noise impacts from bus and automobile traffic along the corridor and at LRT station locations also are expected to be less than significant because the stations are located in relatively commercial and industrial areas.

Table 5.11-5 shows the predicted LRT hourly Leq noise level and the predicted reduced vehicular traffic noise levels for representative locations along the alignment noise measures the sensitive receptor/locations. (Please refer to Appendix D, "Noise and Vibration Data Sheets.")

| TABLE 5.11-5<br>PREDICTED LRT AND TRAFFIC NOISE LEVELS (LEQ, dBA) | | | | | | |
|---|---|---|---|---|---|---|
| Roadway | From | To | Year 1997 Existing Noise | Year 2020 LRT Noise* | Year 2020 Traffic Noise | Year 2020 LRT and Traffic Noise Combined |
| No. Temple | "Airport" | Redwood | 67 | 52-54 | 69 | 69 |
| No. Temple | Redwood | 900 West | 65-69 | 56-58 | 72 | 72 |
| No. Temple | 900 West | 400 West | 65-69 | 58-60 | 75 | 75 |
| 400 West | No. Temple | 400 South | 63 | 59-61 | 77 | 77 |
| 400 South | 400 West | 200 East | 63-67 | 64-66 | 70 | 72 |
| 400 South | 200 East | 1000 East | 70-71 | 56-58 | 77 | 77 |
| 500 South | 1000 East | University | 69 | 55-57 | 72 | 72 |
| So. Campus | University | Wasatch | 63 | 64-66 | 65 | 69 |
| Wasatch | So. Campus | So. Medical | 58 | 52-54 | 60 | 61 |
| So. Medical | Wasatch | "terminus" | 64 | 62-64 | 68 | 69 |

* 50 feet Leq(h) based on worst-case 4-car train at 35 mph and 10 minute headways.

It is clear that the noise associated with the LRT Alternative does not exceed "ambient plus 5 dB" criteria. However, it does exceed NAC Category 2 criteria (67 dBA) at all residences along the alignment and it also exceeds NAC Category 3 criteria (72 dBA) at commercial locations along 400 South east of 200 East. The existing noise levels exceed NAC criteria and the proposed LRT Alternative does not increase noise levels by an amount perceptible to the human ear.

**Operational Vibrations**

Included in the vibration assessment were sensitive receptors within approximately one block of the alignment and those used in the noise impact assessment. No vibration-sensitive industrial or research processes were identified adjacent to the alignment. Vibration and vibration-induced noise from light rail vehicles were predicted for representative locations. (See Table 5.11-6)

Predicted LRT vibration levels range from 65 VdB at 100 feet to 85 VdB at 25 feet. The results of the vibration analysis are given in Table 5.11-6 and show that only for commercial, institutional and industrial properties within 50 feet of the nearest track along the alignment would experience LRT project vibrations which exceed the 75 VdB criterion level shown in Table 5.11-3 (Category 3, frequent events) when within 50 feet from the nearest track. Predicted LRT vibration would exceed the residential impact criteria of 72 VdB (Category 2, frequent events) at residential locations within 70 feet of the nearest track. However, no residences occur within 70 or 50 feet of the LRT tracks.

| TABLE 5.11-6<br>LRT VIBRATION LEVELS (VdB) | | | | |
|---|---|---|---|---|
| Roadway | From | To | ROW Distance from Track, feet | Year 2020 LRT Vibration Level @ ROW |
| No. Temple | "Airport" | Redwood | 48 | 78 |
| No. Temple | Redwood | 900 West | 48 | 78 |
| No. Temple | 900 West | 400 West | 58 | 75 |
| 400 West | No. Temple | 400 South | 48 | 78 |
| 400 South | 400 West | 200 East | 58 | 75 |
| 400 South | 200 East | 1000 East | 58 | 75 |
| 500 South | 1000 East | University | 58 | 75 |
| So. Campus | University | Wasatch | 48 | 78 |
| Wasatch | So. Campus | So. Medical | 58 | 75 |
| So. Medical | Wasatch | "terminus" | 48 | 78 |

### 5.11.4 Noise and Vibration Mitigation Measures

**No-Build Alternative**

No noise and vibration mitigation measures are recommended for this alternative because there would be no new construction.

**LRT Alternative**

The receptors identified in the previous discussion as being impacted by operational noise from the project are the residences located along the alignment and commercial receptors along 400 South east of 200 East. The main noise impact to these receptors would be from vehicular traffic along the alignment. Since existing noise levels exceed NAC criteria and the proposed LRT Alternative only increases noise levels between a minimum of 1 dBA and a maximum of 3 dBA (3 dBA is the smallest difference perceptible by the human ear), no noise mitigation measures are recommended especially in light of the effects of auto traffic alone. No vibration mitigation measures are recommended since no vibration impacts resulting from LRT operation are anticipated.

## 5.12 UTILITIES

### 5.12.1 No-Build Alternative

Salt Lake City utilities have indicated they would like to take advantage of the opportunity to replace some of their older facilities within the corridor. One disbenefit associated with No-Build is that the opportunity to marry the LRT construction with utility upgrading is lost. Altering those utilities in the future will ultimately have an effect on traffic, pedestrians, and businesses.

## 5.12.2 LRT Alternative

Preliminary analysis suggests that some utility relocations will be necessary to accommodate LRT. Identifying all of the relocations is not possible because the final alignment within the corridor has not been selected. In general, the number of conflicts would be greatly reduced in the areas of the corridor where the LRT runs in the center of the street as opposed to curbside (on 400 South between 400 West and 200 East). Coordination will be required with each utility owner to determine the appropriate course of action at each potential conflict. The utility owners may be able during final design to accomplish upgrades, replacements, and/or repairs concurrently with any required relocations.

**Storm Drain**

A potential conflict with the City Creek Aqueduct, between 600 West North Temple and the Jordan River, is possible in the platform areas where the LRT track beds are further from the centerline. The aqueduct is in the south one-third of North Temple in this area. The track beds will cross the 84-inch aqueduct at the Jordan River where the aqueduct discharges into the Jordan River. The depth of the track beds may conflict with the crossing. The aqueduct contains a high volume of canyon and surface runoff and is essentially at least half full all year long.

**Sanitary Sewer**

Relocations are anticipated on 400 West. Sewer lines run for some of the corridor on 400 West in the center of the street. Service interruption for conflicting lines can be minimized by constructing temporary bypasses during relocation and reconnection. Proper construction of the bypasses will avoid raw sewage spills into the drainage system. Numerous crossings were identified, however, at the typical depth of installation (5 feet or more), most of the sanitary sewer crossings will likely not require relocation. Potholing during construction will verify this.

**Water**

**Potable Water**

There are potential longitudinal conflicts with a 6-inch line under the North Temple viaduct, with a 10-inch line on 400 West between North Temple and 200 South; a 30-inch line on 400 West; a 6-inch line on 400 South between 400 West and 300 West; a 12-inch line on 400 South between 400 West and 300 West; and with a 30 inch cast iron pipe on 400 South at undefined locations. It is likely that the great majority of the 60 crossings will not require relocation because of the typical depth of installation of water lines. Those that may require relocation will have to be evaluated to determine the most effective treatment based on line usage, age, depth and future requirements. Options include looping the line under the tracks, replacing the line, abandoning the line and realigning portions of the line (other options exist).

**Heated Water**

A conflict exists with a group of four heated water lines on the University of Utah campus at South Medical Drive. The lines are buried 6 to 8 feet and carry water at 400° F. They are becoming corroded and occasionally fail at varying points within the system. Treatment of this conflict could be accomplished in a number of ways including, but not limited to, placing a concrete slab over the lines, bridging over the lines, and placing the lines in a tunnel under the track. Temporary interruptions to the system can be tolerated by the University. Discussions with the University are underway to determine the prudent course of action and to be consistent with the long term University plan for replacing the lines.

**US West**
Three major junction vaults were identified by US West in the corridor: near the Huntsman Center on the University of Utah campus; on 400 South (east end); and on 400 South downtown near Main Street. The extent of conflict with US West is unclear, however, thorough coordination will occur throughout the engineering and design process. Service interruptions can be minimized with proper communications and lead time for relocations.

**Questar Infocomm (QI)**
If the LRT is center-running, there are no obvious major conflicts with QI lines. QI location maps indicate that the typical cover on their lines is 3 feet. Where the track beds cross QI lines the lines may have to be lowered. No service interruptions are anticipated based on current information. Coordination will occur during final LRT design to determine if there are any potential conflicts on 400 South, between 400 West and 200 East.

**TCI Cable**
The majority of the crossings identified were aerial. It is likely that some but not all of the aerial crossings will conflict with the LRT catenary wire infrastructure. Aerial conflicts can be dealt with in a number of ways including raising the lines, burying the lines, eliminating the lines through consolidation, and rerouting the lines to other poles. These treatments may result in significant service interruption. Underground crossings should be able to be lowered if a conflict exists.

**Brooks Fiber Communications (BFC)**
Because the BFC lines generally run near the sidewalk, no significant conflicts are anticipated with the track beds and platforms in the parts of the corridor where the LRT alignment is in the middle of the street. On 400 South, between 400 West and 200 East where widening is required, curb and gutter may be relocated to a point at or near the BFC lines creating a possible conflict depending on the depth of installation. Another potential conflict with the lines may be created by pole foundations after the street is widened (street lights, power poles, catenary poles if side poles are used). BFC lines that cross the corridor may have to be lowered to accommodate the track beds, depending on the depth of the line trenches.

**MCI**
No conflicts with MCI are anticipated.

**Utah Power and Light (UP&L)**
Significant coordination with UP&L is required to design the electrification system for LRT. The full impacts to the UP&L existing facilities cannot be determined at this time.

**Electric Lightwave (EL)**
It appears that there will be no conflicts with EL facilities.

**Questar Gas**
There is a potential longitudinal conflict with a 10-inch line on 400 South between 200 East and 400 East. This line will likely have to be relocated. It is also likely that some of the 41 identified crossings will require lowering. These relocations will require that sections of Questar's system be shut down for short time periods. The extent of the impact depends on the characteristics of the system (valves, capacity, etc.). With proper coordination, any outages required for relocation should be able to be minimized.

### 5.12.3 Utilities Mitigation

Since all impacts to utilities will be caused during LRT construction, mitigation measures are addressed in Section 5.19, "Summary of Construction Impacts".

## 5.13 AIR QUALITY

Motor vehicles generate air pollutants including carbon monoxide (CO), nitrogen oxides/ hydrocarbons (ozone [$O_3$] precursors), lead, and suspended particulates less than 10 microns in diameter ($PM_{10}$). Because of historic exceedances of the National Ambient Air Quality Standards (NAAQS) for CO, $O_3$, and $PM_{10}$, the Salt Lake City urban area is currently designated a non-attainment area for these criteria pollutants and the area is in danger of losing federal funding for transportation projects. (Section 3.13 discusses the NAAQS and attainment status in greater detail). The 1990 Clean Air Act Amendments require transportation agencies in nonattainment areas to assume greater responsibility in improving air quality. Therefore, microscale air modeling has been performed to determine the impact of the LRT Alternative on CO concentrations in the study area as part of the Transportation Conformity Analysis for the project as required under federal conformity regulations (40 CFR Part 93 and 40 CFR Part 51 *et.seq.*).

Since there have not been any violations in the last three years, the State of Utah has requested EPA to redesignate the area from non-attainment status for CO and $O_3$. However, the area needs to reduce growth in travel (or reduce air emissions from transportation-related sources) to continue to meet air quality standards and thus retain federal funding (WFRC, 1997).

The West-East LRT project is now included as part of the conforming 2020 Long-Range Transportation Plan (LRTP) of the conforming State Implementation Plan (SIP). The Wasatch Front Regional Council recently revised the LRTP for the Salt Lake area to include the West-East LRT project. The project needed to be included in a conforming LRTP prior to issuing the Final EIS and Record of Decision. The 1999-2003 Transportation Improvement Plan (TIP) also includes the West-East LRT project. Both the LRTP and the TIP have been submitted to the Federal Highway Administration and Federal Transit Administration for approval. A positive conformity has been obtained from both agencies.

For this project, the pollutant of most concern is CO. An odorless, invisible gas, CO is dangerous to humans in high concentrations because it binds to red blood cells more effectively than oxygen, limiting the oxygen available for respiration. No air quality analysis was performed for other pollutants for reasons described below.

Near the earth's surface, ozone is an irritant and a major contributor to photochemical smog. Motor vehicles emit nitrogen oxides and hydrocarbons, which are ozone precursors, but the contribution of a single transportation project to total areawide ozone is negligible and difficult to model accurately. Areawide ozone modeling would be of very limited usefulness to this study and was therefore not conducted. Airborne lead levels have declined steadily as leaded gasoline usage declines; no modeling of lead has been performed for this study.

Motor vehicles emit small amounts of particulates, but most are deposited within the roadway right-of-way. In urban areas, roadway traffic on paved streets contributes an insignificant percentage of total ambient particulate concentrations compared to stationary sources. Quantitative hot-spot analysis of particulates is required by law in $PM_{10}$ non-attainment areas, but this requirement will not take effect until EPA has released modeling guidance in this area, as noted in 40 CFR 93.123(b), paragraph 4. Since there is no such guidance at this time, and therefore, no accepted way to measure particulate hot-spot emissions, modeling of particulates cannot be performed at this time.

The following is a summarization of the CO "hot spot" dispersion modeling that was performed. The complete air quality technical report "Carbon Monoxide 'Hot Spots' Air Dispersion Analysis for the West-East Corridor Study FEIS, Volume 1 and 2", is available for review upon request.

## 5.13.1 Methodology

Prior to performing any modeling, a protocol was produced and submitted to the Utah Department of Environmental Quality's Division of Air Quality (DAQ) for approval. This protocol described the exact methods to be followed for the CO analysis. DAQ provided input before ultimately approving the protocol.

Traffic studies conducted for the MIS/DEIS indicated that the proposed alignment will potentially impact three intersections. Deterioration in the level of service (LOS) at these intersections potentially could increase localized concentrations of CO due to queuing traffic at signals. These three intersections were selected for "hot spot" analysis. One additional intersection was selected because of the impact on signal timings due to the LRT alignment turning at this intersection. Two additional intersections were selected as representative of traffic conditions elsewhere along the proposed alignment. Table 5.13-1 lists the intersections where "hot spot" analysis was performed.

**Table 5.13-1**
**Intersections Along LRT Alignment Selected for "Hot Spot" Analysis**

| Intersection Number | Location | Reason For Selection |
|---|---|---|
| 1 | North Temple/Redwood Rd. | Representative location |
| 2 | 400 South/400 West | Most impacted by alignment turn |
| 3 | 400 South/West Temple | Highest Volume and LOS degradation |
| 4 | 400 South/State Street | Highest Volume and LOS degradation |
| 5 | 400 South/700 East | Highest Volume and LOS degradation |
| 6 | 500 South/1300 East | Representative location |

The years that were analyzed for CO impacts were the years 2001 and 2020. Emission rates for vehicles were determined based upon local conditions, such as inspection/maintenance programs, vehicle anti-tampering programs, local meteorological conditions (five years of historic data were used), etc. Appendix A of the air quality technical report, entitled "Protocol for Conducting Carbon

Monoxide 'Hot Spot' Analysis," provides a detailed description of all the assumptions that were made to determine emission rates with the MOBILE5a_h model. Intersection traffic operations were determined using the SIGNAL94 model as described in greater detail in Section 4.

The model CAL3QHCR was utilized to determine the dispersion of CO from vehicles to receptor sites (locations that could be affected by CO). CAL3QHCR is a refined version of the CAL3QHC dispersion model. Like CAL3QHC, CAL3QHCR takes into account the meteorological conditions (wind speed, direction, etc.), the number of vehicles, the physical layout of the intersection modeled, the traffic signal phasing, vehicle delay, and other factors to determine a concentration of CO at receptors. CAL3QHCR permits a more refined modeling of CO than CAL3QHC as it uses real-world meteorological data and hourly traffic variation. Appendix A of the air quality technical report provides a detailed description of all the assumptions that were used with the CAL3QHCR model.

The CAL3QHCR model can be run at two different levels of analysis. A "Tier I Analysis" evaluates CO levels based upon historic hourly meteorological data, and therefore reflects hour-to-hour variation of the weather. Traffic data, however, is limited to one worst-case condition, and therefore reflects conditions that are worse than the real world, since the highest traffic congestion and delay does not persist over a 24-hour period, but rather varies with the time of day or night. Ordinarily, a Tier I Analysis is adequate if modeled conditions do not exceed standards, and no further analysis would be necessary.

However, if the Tier I Analysis indicates a potential exceedance of standards, a Tier II Analysis is warranted. A Tier II Analysis enables the modeler to consider the variation of traffic over the course of up to seven daily 24-hour periods. This approach, however, is more data- and time-intensive, and is not used unless necessary. Since the daily traffic variation is considered, this approach is more reflective of real-world conditions, and generally results in lower modeled values than in Tier I. The analysis that was performed is considered a "limited" Tier II analysis since only one 24-hour period was modeled (rather than up to seven discrete days) and three signalization cycles (morning, midday/evening, nighttime) were considered (rather than a maximum of 24 separate hourly variations in traffic).

CO concentrations are modeled to ensure that there are no exceedances of one-hour and eight-hour standards. A Tier I analysis was adequate to demonstrate that there would be no modeled exceedances of the one-hour CO standard associated with the project. It was necessary to perform a Tier II analysis to demonstrate that there would be no exceedances of the eight-hour standard.

For year 2001, the first year of post-construction activity, and year 2020, the design year, AM and PM peak conditions for each intersection were analyzed for the LRT alternative. For all runs, five years of real-world meteorological data from Salt Lake City International Airport was used to determine worst-case meteorological conditions.

UDAQ performs monitoring of local CO concentrations. UDAQ's CO ambient monitoring station closest to the study area is located in a mid-block location at 1401 South State Street, several feet from the roadway. Data from this site was adjusted based upon emission rate projections and existing modeled conditions to determine appropriate background levels to use for the study area for current conditions, 2001, and 2020.

Most of the selected intersections modeled lie within the downtown area of Salt Lake City. Aerial photos and field surveys indicate that office buildings, shops, and parks line the street at most of the corners. At intersections where buildings line the corners, receptors with an elevation of 6 feet were placed at 50-foot intervals along the sidewalks on all four corners of each intersection. For those corners identified in the field surveys that have additional locations where public exposure for longer averaging times (e.g. an eight-hour period) are possible, additional receptors were placed. These receptor locations will provide a screening analysis for each of the modeled scenarios. A list of the additional receptors is provided in Table 5.13-2.

**Table 5.13-2**
**Additional Discrete (Worker) Receptor Locations**

| Intersection Number/Name | | Selected Receptor Location |
|---|---|---|
| 2 | 400 West/400 South | Pioneer Park, Central Fountain |
| 4 | State Street/400 South | Hourly Parking Lot, Attendant Kiosk |
| 4 | State Street/400 South | County Building, Bench 1 |
| 4 | State Street/400 South | County Building, Bench 2 |
| 4 | State Street/400 South | County Courthouse, Northern Courtyard |
| 6 | 1300 East/500 South | Friendship Manor Retirement Apartments, Porch |

## 5.13.2 Modeling Results

Tables 5.13-3 and 5.13-4 provide the results of the one-hour and eight-hour CO concentration modeling. As Table 5.13-3 shows, there are no anticipated future exceedances of the one-hour CO NAAQS standard of 35.0 ppm under the LRT Alternative. As this modeling only incorporated a Tier 1 effort, it is assumed to be conservative, since most worst-case meteorological conditions occur during the middle of the night, which would have lower traffic volumes than are modeled in Tier I.

**Table 5.13-3**
**Tier I CO Analysis**
**Highest Modeled One-Hour CO Concentrations in Parts Per Million (ppm)**

| Intersection and Number | | 2001 LRT Alternative | 2020 LRT Alternative |
|---|---|---|---|
| 1 | North Temple/Redwood Rd. | 30.6 | 25.8 |
| 2 | 400 South/400 West | 24.1 | 21.5 |
| 3 | 400 South/West Temple | 17.1 | 14.5 |
| 4 | 400 South/State Street | 21.0 | 18.7 |
| 5 | 400 South/700 East | 33.1 | 31.1 |
| 6 | 500 South/1300 East | 32.6 | 25.3 |
| **Background Component of Above Totals** | | **3.5** | **1.8** |
| **NAAQS Standard** | | **35.0 ppm** | |

The eight-hour CO concentrations were modeled under the more rigorous limited Tier II analysis, which reflects more "real world" conditions by considering hourly variation in traffic over the course of a day. This analysis assigned different traffic volumes and signalization cycles for morning hours

(5 AM to 11 AM), midday/evening (11 AM to 10 PM) and nighttime (10 PM to 5 AM). In the case of the Tier II modeling efforts, since accuracy of the model was more critical, the second-highest modeled value of the year is reported. This was done because one exceedance of NAAQS standards is permitted in each calendar year before a violation is recognized.

The results, listed in Table 5.13-4, showed that modeled CO concentrations at these locations would be below the NAAQS standard.

**Table 5.13-4**
**Limited Tier II CO Analysis**
**Second-Highest Modeled Eight-Hour CO Concentrations in Parts Per Million (ppm)**

| Intersection and Number | | 2001 LRT Alternative | 2020 LRT Alternative |
|---|---|---|---|
| 1 | North Temple/Redwood Rd. | 8.8 | 7.5 |
| 2 | 400 South/400 West | 6.6 | 5.5 |
| 3 | 400 South/West Temple | 6.3 | 5.8 |
| 4 | 400 South/State Street | 7.2 | 6.2 |
| 5 | 400 South/700 East | 8.9 | 8.2 |
| 6 | 500 South/1300 East | 8.9 | 8.3 |
| **Background Component of Above Totals** | | **3.9** | **3.0** |
| **NAAQS Standard** | | **9.0 ppm** | |

As noted previously, at additional locations where public exposure for longer averaging times (e.g. an eight-hour period) are possible, additional receptors were modeled. A list of these additional receptors was provided in Table 5.13-2. Tables 5.13-5 and 5.13-6 show the Tier I and Tier II modeling results at these receptors. In no case was any of these receptors modeled with CO levels that exceeded standards.

**Table 5.13-5**
**Tier I CO Analysis**
**Highest Modeled One-Hour CO Concentrations in Parts Per Million (ppm) at Discrete ("Worker") Receptor Locations**

| Receptor Location | 2001 LRT Alternative | 2020 LRT Alternative |
|---|---|---|
| Pioneer Park, Central Fountain | 6.8 | 6.8 |
| Parking Lot, Attendant Kiosk | 17.4 | 14.4 |
| County Building, Bench 1 | 14.2 | 9.6 |
| County Building, Bench 2 | 14.6 | 10.1 |
| County Courthouse, Courtyard | 11.5 | 9.2 |
| Friendship Manor Porch | 20.9 | 19.7 |
| **Background Component of Above Totals** | **3.5** | **1.8** |
| **NAAQS Standard** | **35.0 ppm** | |

| Table 5.13-6<br>Limited Tier II CO Analysis<br>Second-Highest Modeled Eight-Hour CO Concentrations in Parts Per Million (ppm) at Discrete ("Worker") Receptor Locations | | |
|---|---|---|
| Receptor Location | 2001<br>LRT Alternative | 2020<br>LRT Alternative |
| Pioneer Park, Central Fountain | 4.5 | 3.7 |
| Parking Lot, Attendant Kiosk | 5.1 | 4.7 |
| County Building, Bench 1 | 5.6 | 4.7 |
| County Building, Bench 2 | 5.7 | 4.9 |
| County Courthouse, Courtyard | 5.6 | 4.5 |
| Friendship Manor Porch | 8.1 | 7.5 |
| **Background Component of Above Totals** | **3.9** | **3.0** |
| **NAAQS Standard** | **9.0 ppm** | |

### 5.13.3 Conclusions and Mitigation

The modeling results in Section 5.13.2 indicate that no intersections are predicted to experience significant, project-related CO levels that exceed the NAAQS standard. At additional locations with possible eight-hour public exposure, additional receptors were modeled. None of these receptors would be impacted by CO levels that exceeded standards in any scenario.

No specific mitigation measures are called for since the project will not create any significant impact.

UDAQ monitoring data indicates that no exceedances for the CO NAAQS have occurred in Salt Lake County for several years. Conservative CO modeling ("worst-case") assumptions were used in the emission factor modeling and dispersion modeling. Emission factors do not take into consideration use of low-emission vehicles or conversion of buses to use alternative fuels which would lower CO levels. Therefore, there is reason to believe that future CO levels may be lower than the modeled results. Coordination with UDAQ is completed regarding the results of the air quality analysis. Final UDAQ project correspondence is included in Section 7.4.

## 5.14 POTENTIAL CONTAMINANT SOURCES

The information presented in this section is a summary of the Phase I Site Assessment (potential contaminant study) prepared for the West-East Light Rail FEIS, and presented in Appendix E. The process used to prepare this potential contaminant survey was the "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process" using American Society for Testing and Materials E 1527-97. Any site listed in any regulatory database including archived sites, and all file information including information on closed sites were reviewed.

The Phase I Site Assessment Report is based on the review of documents and aerial photographs supplied by the Salt Lake County Recorders Office, Olympus Aerial Surveys, Inc., University of Utah Marriot Library, Utah Department of Environmental Quality, Division of Environmental Response and Remediation (UDEQ, DERR), Wasatch Front Regional Council, and De Leuw Cather Company. Many databases from the United States Environmental Protection Agency (USEPA), and the State of Utah Department of Environmental Quality (DEQ) were reviewed as well as regulatory documents obtained during several Government Records Access and Management Act (GRAMA) searches of DEQ Division of Environmental Response and Remediation (DERR) documents. A partial listing of the databases searched are as follows:

- RCRA Corrective Action (CORRACTS);
- RCRA Generator list (GNRTR);
- Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS);
- Utah Registered Underground Storage Tank (UST) List;
- Utah Leaking Underground Storage Tank (LUST) List;
- Utah Landfill Inventory;
- USEPA National Superfund Priority List (NPL);
- Emergency Response Notification System List (ERNS);
- Facility Index System (FINDS);
- Toxic Chemical Release Inventory System (TRIS);
- PCB Activity Database System (PADS); and others.

Generally, due to the length of the West-East LRT corridor, (10.9 miles) and shallow depth to groundwater at sites adjacent to the alignment, six sites were indicated as potentially contaminated which will require additional investigation. All of the sites requiring further investigation are located on North Temple west of 400 West. A Phase II Environmental Site Assessment (ESA) was necessary to evaluate these sites further. The potential contaminant sources required further investigation and/or remediation were:

- Leaking Underground Storage Tanks, or sites that have recorded significant petroleum product spills;
- Sites where volatile, halogenated, and semi-volatile organics, and metals have been released to the environment, through CERCLA, or RCRA activities/sites have occurred.

A CERCLA site is one which has been abandoned by its owners and/or operators, and a potential exists or is already occurring for releases of hazardous wastes to the soil, groundwater, and air. RCRA sites are those which store, treat, transport, dispose, or generate hazardous and solid wastes. Underground storage tanks are also regulated under this law.

### 5.14.1 Characterization

In order to determine if a potential contaminant source warrants a Phase II Environmental Site Assessment (ESA) to determine if it will impact the West-East LRT, additional information was required. The American Society for Testing and Materials E1903-97, "Guide for Environmental Site Assessments: Phase II Environmental Site Assessment Process" was consulted. The Phase II Assessment began with an evaluation of sites that needed further characterization in order to determine if contamination was present. Potential contaminant sources were evaluated in order to determine if a Phase II Assessment was required:

- presence of contaminants in soil and groundwater;
- groundwater flow direction;
- presence of free product on water table;
- potential unknowns; and
- warnings from regulators.

Information was obtained from regulatory documents obtained during a government records and management GRAMA search at the DEQ-DERR. The information pertaining to each site was evaluated using the factors above and information supplied by the design team and project engineer, to more accurately determine the location of the LRT Alignment and the depth below ground surface required to install the LRT and the stations.

If the depth to groundwater is less than five feet below ground surface the site would not be listed unless groundwater flow is off-site toward North Temple Street, and the site is contaminated with organic compounds. If contamination presence at the site is unknown, but is believed to have a Health and Safety impact on the installation of the alignment, then a Phase II ESA was performed.

A Phase II ESA was conducted using a Geoprobe™ to collect soil and shallow groundwater samples on the LRT right-of-way adjoining these sites:

- The Palms, one location;
- Litton Guidance Systems, two locations;
- Ault's C Store, two locations;
- Smith's Gas and Video, one location;
- South Temple Landfill, two locations; and
- North side of former used oil drum storage area , Acme Auto Wrecking, Japanese Section Camp, Oregon Short Line Rail Road Foundry and 30+ Union Pacific and D& RGW railroad tracks, three locations.

Phase II ESAs for the LRT Alignment adjoining these sites were conducted in mid-August. The analytical results for Litton Guidance Systems indicates the presence of Acetone and Freon 113. However, Acetone and Freon 113 are not listed in the regulatory guidance. Also, the concentrations of trichloroenthene, and 1,1-dichloroethylene in the groundwater have exceeded the regulatory guidelines at this site. The soil and groundwater samples collected north west of The Palms did not indicate the presence of any gasoline constituents.

At the Ault's C Store location no contamination was discovered. For the South Temple Landfill site, no volatile organics were detected in the soil samples; however metals were present. The soil contained arsenic, barium, chromium, and lead. The concentrations of arsenic and barium in the groundwater were below the Utah Water Quality Standards for those samples. Two groundwater samples contained acetone at a concentration of 30 and 75 ug/L, respectively. The arsenic concentrations in two samples exceeded Utah Groundwater Quality Standards. The concentrations of chromium and lead in the duplicate sample exceeded Utah Groundwater Quality Standards. At the Smith's Gas and Video site, no contaminants were detected. Soil sample #9 was collected north and west of the former location of Acme Auto Wrecking. The exact sample location was at the southeast corner of 600 West and North Temple Street. The sample was collected in brown clay and contained lead at 220 mg/kg, and chromium at 9.2 mg/kg. The current Environmental Protection Agency Office of Solid and Hazardous Waste and Emergency Response (OSWER) risk based screening level (RBSL) for lead is 400 parts per million (ppm). The most stringent RBSL for chromium is 230 mg/kg for a residential area. However, the disposition for soil disposal, if excavation is required in this area, should be negotiated between USEPA/DEQ Division of Solid and Hazardous Waste and UTA/TRAX prior to construction. Several polynuclear aromatic hydrocarbons were located in the soil at the site but all were below the RBSL. Arsenic levels in soil exceeded the RBSL at this location.

Sample # 10 was collected beneath the stairs leading to the walkway across the North Temple Bridge. This area is near the location of the former Japanese Section Camp, and was used for used oil drum storage during the 1980's. Arsenic levels in soil exceeded the RBSL at this location. Sample #11 was collected at the intersection of the North Temple Bridge Off ramp onto 400 West. The Oregon Short Line Railroad foundry was located due west of the sample location. Rails were located through the site at times in the past. All contaminants detected in the soil were below the RBSL except for arsenic. At the wrecking site and Acme Auto sites, no contaminants were detected.

A foundry and roundhouse operated by the Oregon Shortline Railroad was present at the corner of North Temple and Forth West in 1898. In 1911 the Sanborn maps indicate that the area from 400 West to 500 West was covered with 30+ sets of railroad tracks. A Japanese Section Camp was located at the southeast corner of the intersection of North Temple and Fifth West from 1911 to at least 1950. On a Sanborn map dated 1986, it indicates that the site occupied by the Japanese Section Camp was used for Used Oil Drum Storage. From 1937 to at least 1950 the site at 555 West was covered with a auto wrecking yard. These operations are located south of North Temple Street. Soil samples from these locations contained polynuclear aromatic hydrocarbons, and the metals arsenic, barium, chromium and lead. Due to past industrial land uses in the area of the existing viaduct, additional Phase II soil samplings may be necessary in the area around the proposed LRT bridge footings. Currently, the exact location and depth of the LRT bridge abutment footings is not known, so those exact locations, and depths cannot be sampled. Therefore, a second phase of sampling will be required at these locations prior to installation of the bridge footings to determine the presence of contaminants

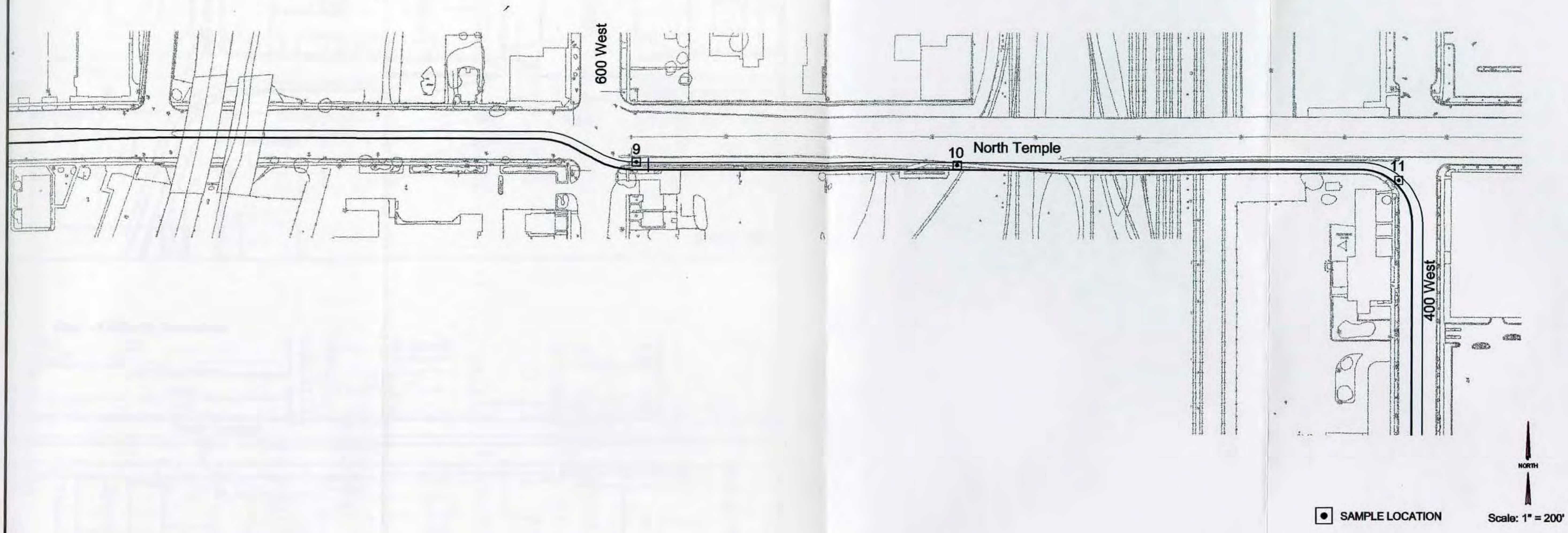
A Phase I Site Assessment has been conducted for the parcel of land located south of North Temple between 2500 West and 2400 West. This parcel of land, which contains six buildings, will be purchased and used for the LRT maintenance facility. The results of the Phase I assessment show that asbestos and lead paint may be present in the building materials of the two vacant buildings. Also, past groundwater contamination has occurred as evidenced by the groundwater monitoring wells near one of the vacant buildings and on airport property. A Phase II site assessment will be conducted before final design is completed to more accurately assess the potential contaminant sources of the buildings that would be displaced.

### 5.14.2 Mitigation

If the Phase II site investigation of the maintenance facility parcel determines that sufficient contamination is present to warrant remedial activities at that site, the best-cost remedial alternative for that site will be proposed. The alternative will be based on effectiveness in alleviating the risk to human health and the environment, efficiency of contaminant removal, and cost to implement the process.

Coordination with all concerned parties is very important, especially any regulators involved with the process. If contaminants are encountered in the subsurface, State of Utah Department of Environmental Quality (DEQ) personnel will be contacted to discuss options for mitigation. All discussions and responses will be coordinated with the County Health Department, state and federal agencies as appropriate.

Section 5.14 lists potential contaminated sites identified during the Phase I and Phase II hazardous waste assessments. Any contaminated groundwater encountered during construction shall be handled according to recommendations negotiated between UTA and the USEPA/DEQ during design-build operations prior to construction activities.

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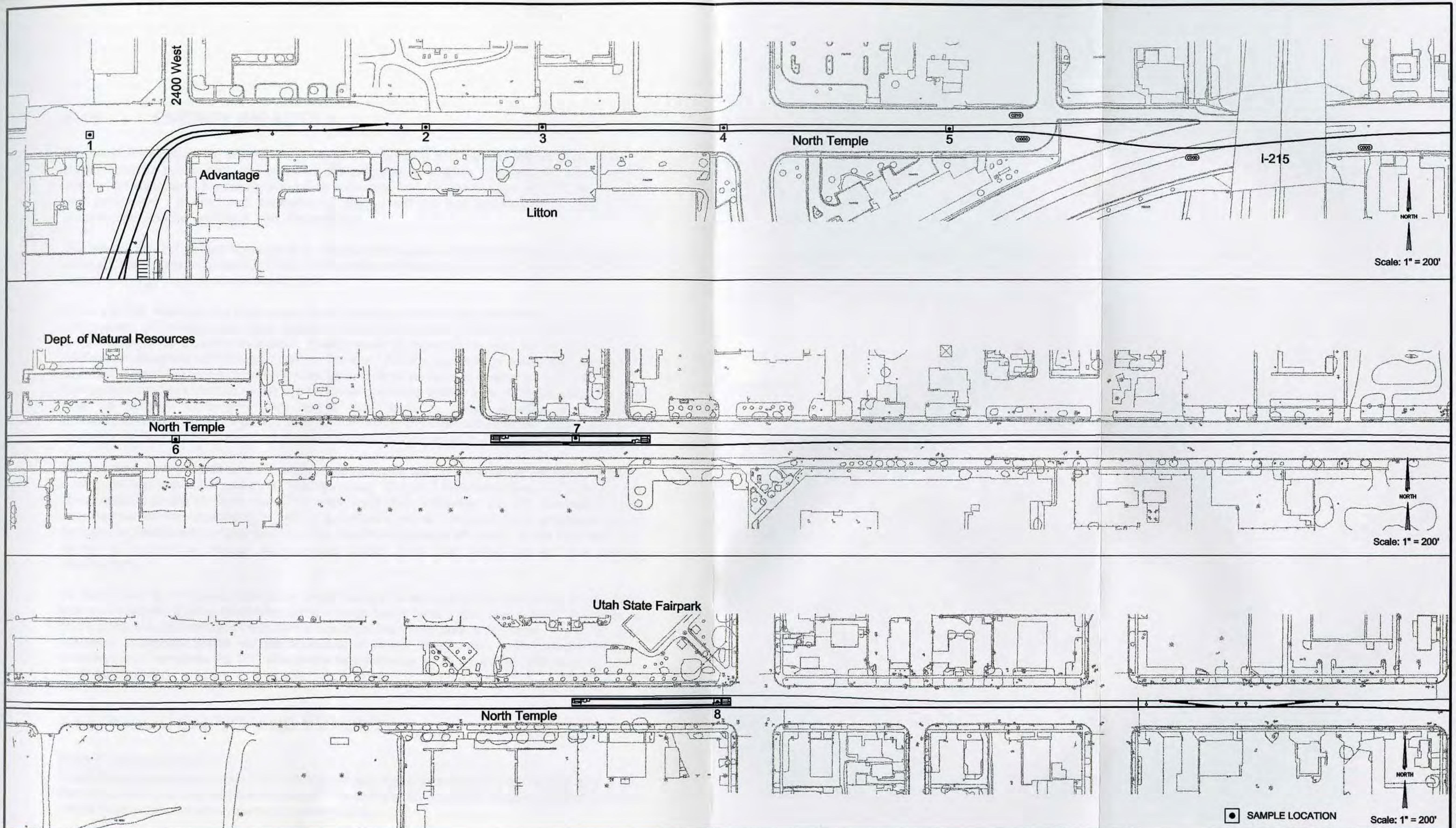
SOUTH JORDAN, UTAH 84095 (801) 553-1944

## Soil and Groundwater Sample Locations

Figure 5.14-b

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Soil and Groundwater Sample Locations

Figure 5.14-a

## 5.15 ENERGY IMPACTS

This section describes the effects of the No-Build Alternative and the LRT Alternative on energy consumption for construction and operation of transportation facilities. The analysis conducted for this section considered the energy that will be consumed for LRT construction, vehicle manufacture and propulsion. Station and maintenance energy will not add significantly to overall fuel consumption and were omitted from the analysis.

The West-East LRT project would result in positive and negative impacts on energy consumption, although the long-term positive impacts from greater efficiency would likely offset the short-term negative energy impacts from construction.

Under the LRT Alternative, a large expenditure of energy would be required initially to construct the LRT system, LRT stations and other facilities. Clearing and grading activities would require energy to run the heavy construction equipment. Energy would be expended to produce the rails and other LRT system materials and transport them to the site. Additionally, energy would be expended by the manufacturers producing the LRT vehicles and other equipment needed for LRT operations. During construction motorists would use vehicular operating energy less efficiently because they may be subject to detours and delays that result in idling vehicles and frequent acceleration/deceleration. Propulsion energy, the energy to propel the vehicles, varies relative to the length of the LRT alignment and the total number of vehicle-hours of operations and service.

The number of automobile users shifting to transit under the LRT alternative will result in some energy savings and consequently a positive impact. The LRT Alternative requires more energy consumption than the No-Build Alternative in the short term. However, the LRT Alternative would increase person trip capacity by providing an efficient way to transport many additional people through the West-East Corridor, and therefore maximizing energy efficiency. In the long term, the saving in operational energy requirements would more than offset construction energy requirements.

As mentioned, the No-Build Alternative would require no expenditure in short-term construction energy. However, the No-Build Alternative is projected to have traffic near capacity during peak hours in several locations and travel demand is projected to increase in the future. In the No-Build scenario, automobile traffic will be subjected to longer delays with more acceleration and deceleration. Therefore, the LRT Alternative demonstrates more beneficial effects than the No-Build Alternative.

## 5.16 PUBLIC SAFETY AND SECURITY

### 5.16.1 Introduction

Public transit projects can affect public safety and security by increasing the demand for police and fire protection in the communities they serve. The potential for accidents involving pedestrians also needs to be evaluated when comparing alternatives.

For the purposes of this analysis, an impact in public safety and security is considered significant if:

- The proposed project will not be adequately secured after construction;
- Implementation of the project will require the hiring of additional police or fire protection personnel to maintain existing levels of service in any of the affected municipalities in the corridor;
- The proposed project will have a negative impact on the safety and security of transit patrons;
- The proposed project is expected to result in increased auto, transit, and/pedestrian accidents.

The impacts of the alternatives on safety and security are presented below.

### 5.16.2 Police and Fire Protection

As noted in Section 3.16, police and fire stations are maintained by Salt Lake City throughout the corridor. The Salt lake City Police Department also maintains a mobile law enforcement staff, including uniformed and plain clothes police, as well as community liaison officers who work with neighborhood and community councils. This would remain the same under both the No-build and LRT alternatives. If the West-East LRT line is constructed and implemented, there appears to be adequate coverage to meet police and fire emergencies at stations, and at the maintenance and storage facility at 2400 West. During construction, work site vandalism and theft will likely be the responsibility of the contractor(s). Once the system is operational, UTA will assume responsibility for maintaining safe and secure conditions on the vehicles. Police and fire protection may be required at stations and at the park and ride lot, to assure safety to patrons and vehicles. It is likely that the overall number of response calls related to the project will be only a small percentage of the total calls received by police and fire services. It is unlikely that additional Salt Lake City Police or Fire Department staff will be required to maintain existing service levels. In some areas of the city, such as Pioneer Park, increased pedestrian traffic may serve as a deterrent to much of the existing crime activity. Homeless and transient persons are often victims of crimes in this area. The increase in pedestrian traffic may deter perpetrators because of the increase in available witnesses. If more people are in the area, transients will be less isolated, and crime activity could decrease.

### 5.16.3 Incidence of Related Accidents

Pedestrian traffic is currently restricted in crossing arterial roadways in the corridor. While it is difficult to predict the number of accidents likely to be prevented by improved pedestrian crossings at stations and intersections, the implementation of LRT could have a beneficial, if minimal, effect.

Accidents involving autos and pedestrians may be less likely throughout the corridor, where signalized intersections and pedestrian crossings will be constructed to accommodate pedestrians and autos crossing the LRT lines. Similar improvements will exist at LRT station locations throughout the corridor.

### 5.16.4 Emergency Services

The project is generally anticipated to have a modest impact to emergency response vehicles such as ambulances, fire trucks, and police cars. No existing streets in the roadway system are anticipated to be closed off or lose traffic lanes as a result of this project. Emergency vehicle passage through these streets would generally be comparable under both the LRT and No-Build Alternatives.

One facet of the project that could affect emergency vehicle response times is the changes in traffic signal phasing. As traffic signals are optimized to serve LRT as well as vehicular traffic, there could be signal phases where LRT has exclusive passage (such as where the alignment turns at 90-degree angles). Congestion at specific intersections could be slightly worse under the LRT Alternative and have a minor effect on emergency response. If emergency vehicles are able to pre-empt traffic signals and other vehicles (including LRT trains) yield to emergency vehicles as required by law, it is assumed that the effects of LRT on traffic progression and emergency vehicle progression would be minimal.

An additional problem for emergency services created by LRT will be limited access to properties along 400 South between 400 West and 200 East. The side-running LRT tracks on both sides of the street will eliminate parking-lane access to properties. Emergency services such as ambulances, fire trucks and police cars would likely be required to double-park in a travel lane to access such properties. Training for emergency personnel will be required to develop and implement procedures for the use of fire and rescue equipment in the vicinity of the LRT overhead catenary. This is particularly true on the side running portion of 400 South were the catenary will be between the street area and adjacent buildings. It is likely that emergency services will need to coordinate with property owners and UTA to determine the best way to maintain emergency access to these affected properties without blocking LRT service. Accessing buildings from the side or back may be a potential solution to this problem.

### 5.16.5 Winter Olympics Security

In coordination with public safety and security agencies, LRT design will be carried out to maximize security of LRT passengers and minimize the potential for terrorist related incidents during the 2002 Winter Olympics. Coordination with the Olympic Committee on this matter is anticipated.

## 5.17 ENVIRONMENTAL JUSTICE

In accordance with Executive Order 12898, this section addresses the issue of environmental justice. The purpose of this review is to ensure that low-income households, minority households and minority business enterprises do not suffer a disproportionate share of adverse environmental impacts resulting from federally-funded actions such as transportation projects. Through the evaluation of environmental consequences of alternatives as they apply to minority and/or low income communities, and inclusion of minority and low income persons or populations in the decision-making process, environmental justice analysis ensures the following:

- persons or populations are not discriminated against in making project decisions; or
- denied the benefits of the project; or
- burdened with a disproportionate share of the impacts.

### 5.17.1 Opportunities for Decision-making Involvement

Environmental Justice outreach efforts to date have included newsletters, media announcements in minority publications, public meetings, working groups meeting, information hotlines, open houses, and various other methods of contacting the concerned residents, business owners and other stakeholders within the study corridor. Initial opportunities for involvement by disadvantaged groups were documented in Chapter 2 and Appendix A of the DEIS. A special effort has been made to include low income and minority populations throughout the FEIS process as well. For a detailed summary of the various methods used in the FEIS public involvement process, please see Section 7.

### 5.17.2 Disproportionate Distribution of Impacts and Benefits

In the DEIS, environmental consequences of a range of alternatives were analyzed for disproportionate impacts to minority and low income populations, as well as minority business owners. Analysis documented in Section 5.14 of the DEIS demonstrated that the incidence of minority and low income populations, and minority owned businesses was less than 50 percent of the population, in all parts of the study corridor. It was determined that, as there is no subarea of the corridor that has a majority of low income or minority persons or businesses, there can be no disproportionate impact. Further, all persons in the corridor will have equal access to the proposed transportation improvement, which is the main benefit of the LRT project.

Once the system is operational, residents of the corridor will enjoy the same benefits as commuters. West-East LRT will expand the LRT system currently under construction between Downtown Salt Lake City and Sandy, and offer improved access to commercial, retail, and industrial centers within and south of the corridor. This improved access will in turn expand the opportunity to work, recreate, or shop in areas previously unaccessible by those who either do not own vehicles, or have several hours to spend commuting by bus. LRT offers a fast, high-capacity transportation alternative, more effective than autos or buses because of the travel time savings associated with fixed rail systems. Vehicle ownership in the corridor averages 1.29 cars per dwelling unit with a range of 0 to 3. In Salt Lake County the average vehicle ownership is 1.86 cars per dwelling unit with a range of 0 to 3.47. As the number of vehicles per household is smaller in the corridor than the county, and the percentage of minority and low income persons is greater, the argument can be made that the benefit to minority and low income populations would be equal to, if not greater than the benefit to populations of the outlying areas, due to increased access to the regional transportation system.

### 5.17.3 Anticipated Environmental Impacts

There are no anticipated negative impacts to the natural or man-made environment that would have disproportionate adverse affects on minority or disadvantaged populations, or minority-owned businesses within the corridor.

Feedback from the neighborhoods with minority population located to the west of downtown Salt Lake City indicates that pedestrian access from the neighborhoods to the downtown is very important. This pedestrian access is affected today because of the location of the railroad tracks and I-15 along the west side of downtown. During the design process, steps will be taken to preserve existing North Temple pedestrian access and connections between neighborhoods and downtown. In addition, during the LRT design phase UTA will work with community groups and residents to develop effective bus transit/LRT integration. Transit passenger transfers between existing bus routes and LRT stations that coincide with scheduled LRT stops will be planned. This will ensure easier, more convenient access to the LRT line and bus routes to meet the mobility needs of all residents.

### 5.17.4 Environmental Justice Mitigation

No adverse impacts are anticipated; therefore no mitigation measures are recommended.

## 5.18 SUMMARY OF CUMULATIVE EFFECTS

The following paragraphs present the analysis conclusions regarding cumulative effects for the West-East LRT project.

Visual and Aesthetics - No adverse cumulative effects to the visual environment are anticipated. Considering the opportunity for redevelopment and the urban design features and amenities that will be a part of the West-East LRT system once it is constructed, there may be a beneficial cumulative effect on visual resources.

Land Use - Since the LRT system will generally provide an impetus for improvements to or redevelopment of under-utilized land, such as the Gateway District, the cumulative effect of the LRT project on land use will be beneficial within the corridor.

Parks and Open Space - Since the LRT will not encroach onto the parks right-of-way in any area of the West-East Corridor, no adverse cumulative effects are anticipated. The West-East LRT line will generally improve access to parks and open space in the corridor.

Historic and Cultural Resources - No adverse cumulative effects are anticipated to historic and cultural resources as a result of the West-East LRT project.

Socio-economics - The West-East LRT project will have beneficial cumulative effects with regard to socio-economics due to the potential for redevelopment of some urbanized areas.

Ecosystems - Commercial, industrial, and residential development is currently occurring rapidly on the western side of Salt Lake City. Construction of commercial and educational facilities is also common on the University of Utah campus and in its vicinity. Impacts to vegetation resources from this development are expected to be similar to those impacts anticipated to result from the West-East LRT project. From a city-wide and regional perspective, however, impacts to vegetation resources due to permanent and temporary removal are expected to be insignificant relative to cumulative impacts in the area.

The West-East LRT project will not add to the cumulative reduction in plant species of special concern or to the reduction in suitable habitat conditions for those species.

Cumulative effects of the project on wildlife habitat are considered in the context of all development occurring within the local region of the project. Because construction rates within the Salt Lake

Valley are currently high, cumulative effects are difficult to effectively assess with the rapid development. Since much of the project occurs along existing streets, potential cumulative effects of the project are limited to the west and east ends, where wildlife occurs. In these areas where direct or indirect project impacts will occur, the project will impact relatively small areas of existing wildlife habitat relative to the adjacent habitat areas. In a regional sense, these impacted habitats are of relatively low value and contribute very little to the population viability of any wildlife species in the Salt Lake Valley. As a result, it is anticipated that there will be no cumulative adverse effects of the LRT project to wildlife.

Wetlands - Since the potential development and redevelopment of land uses would occur in highly urbanized areas, the LRT project is anticipated to have no cumulative effects on wetlands. In addition, since the West-East LRT line may help to delay the need for some roadway improvements, and may help to concentrate development in the downtown area, the LRT project may have a slight beneficial cumulative effect.

Water resources and floodplains - Commercial, industrial, and residential development is currently occurring rapidly on the western side of Salt Lake City. Impacts to water resources and floodplains from this development are expected to be greater than those impacts anticipated to result from the West-East LRT project. From a regional perspective, the impacts to water resources and floodplains of bridge expansions over the Surplus Canal and North Point Canal are expected to be insignificant relative to cumulative impacts in the area, especially if those impacts are effectively minimized by the implementation of Best Management Practices. In comparison to the increased runoff from parking lots and buildings associated with commercial/industrial development that is common in the vicinity of the project area, the increased storm water runoff from the LRT project is anticipated to have no cumulative adverse effects to water resources.

Mineral Resources - No cumulative adverse effects to mineral resources by the West-East LRT project are anticipated.

Noise and Vibration - No cumulative adverse effects with regard to noise and vibration caused by the LRT project are anticipated.

Utilities - No cumulative adverse effects to utilities are anticipated. The LRT project will use electricity, but not a consumption level where new infrastructure for power generation will be required.

Air Quality - No cumulative adverse effects on air quality are anticipated for the West-East LRT project.

Potential contaminant sources - Since the potential contaminant sources identified in the West-East Corridor originated from existing sites along North Temple, no cumulative adverse affects are anticipated by the LRT project.

Energy - No cumulative adverse effects to energy consumption are anticipated.

Public Safety and Security - No cumulative adverse effects are anticipated for public safety and security.

Environmental Justice - Since the West-East LRT project would provide better access to lower income neighborhoods, especially in the Gateway District and East Central areas, no cumulative adverse effects are anticipated.

# 5.19 SUMMARY OF CONSTRUCTION IMPACTS

This section examines the anticipated construction impacts of the LRT Alternative. The No-Build Alternative, by definition is a no-construction alternative, would have no construction impact. The following list of potential impacts associated with the LRT alternative were analyzed under the assumption that the construction impacts would be temporary:

- Visual and Aesthetic Quality
- Parks and Open Spaces
- Socioeconomic Impacts
- Erosion, Sedimentation and Water Quality
- Vegetation
- Water Resources and Floodplains
- Wetlands
- Air Quality
- Noise and Vibration
- Utilities and Emergency Services Disruption
- Disposal of Excess Material
- Traffic Delays and Detours

Section 5.19.1 describes the anticipated approach to construction. Section 5.19.2 evaluates temporary impacts and mitigation strategies. For the purpose of evaluating the above list, a significant construction impact was defined as any impact which violated local, state, or federal standards during construction. This list represents the majority of impacts associated with construction of the LRT Alternative.

## 5.19.1 General Approach to Construction

The construction of the LRT project is anticipated to begin in the June, 1999 and be completed in December, 2001, including operational testing. Throughout this time there will be activity within the corridor as the LRT line is constructed. The project contractors are required to conform to the provisions of standard engineering and construction practices to control various adverse impacts associated with construction activities. A brief description of the construction methods for each major project component is given below.

**Trackwork**

Construction activities for the LRT project will be done in the following order: site preparation and clearing, utility relocation and grading, ballast, tie, and track installation. Excavations will generally be shallow, minimizing the need for utility relocation.

Rail sections will be delivered by truck or freight rail. Ballast, ties and turnouts will be delivered by a combination of truck and rail. It is anticipated that concrete and precast members for bridge and retaining wall construction and construction equipment will be delivered by truck.

The relative percentage of materials delivered by truck or rail cannot be estimated at the time because this will be at the discretion of the successful contractors. The contractors will select several points of access to the corridor. Haul routes for construction materials will also be at the discretion of the contractor. It can be anticipated that all of the major arterial roadways crossing the LRT alignment will be affected temporarily.

**Power Systems**
The installation of power systems will occur, for the most part, after the track and station construction is complete. Power poles will be installed in concrete foundations and wire will then be strung between the poles. Cable channel (including communication wire and electrical conduit) construction will occur after track installation. Some conduit may be bored under existing track at Main Street.

**Stations**
The proposed construction for LRT stations will use low platforms. Two station configurations will be used: center of the street platforms and side of the street platforms. Some side of the street platforms will be split at intersections. Platforms will be 355 feet in length, and 18 feet in width. Construction materials will be brought to the site by truck.

### 5.19.2 Temporary Impact Analysis and Mitigation Strategies
The following paragraphs list anticipated construction-related impacts, as well as a description of mitigation strategies for each potential impact.

**Visual and Aesthetic Quality**
Construction activity and disturbance will be visible, and will include short term visual impacts. For residences and businesses located near the project area, there will be temporary negative visual impacts associated with construction work, particularly from earthwork operations, storage of materials/equipment, etc. Temporary visual impacts also include removal of street trees, landscaped areas; the relocation of light standards and street furnishings; and the reconstruction of pedestrian systems and sidewalks along the alignment. The contractor will be required to maintain and restore all work areas and storage yards to minimize these impacts. Street trees, landscaping, street lighting and furnishings will be replaced.

**Parks and Open Spaces**
Along the west and south sides of Pioneer Park, short-term impacts related to construction may occur due to temporary changes in pedestrian and motorist access to park activities or events. These short-term impacts can be minimized by maintaining directional signage to let pedestrians, bicyclists and motorists know how to access the park and where to park their vehicles. No LRT construction will occur along the north and east sides of the park. Therefore, ample parking should still be available for park activities and events.

No construction related impacts are anticipated at Washington Square Park.

**Socioeconomic Impacts**
Merchants and property owners along 400 South between 400 West and 200 East would be affected due to LRT construction. Impacts would include potential loss of visibility and accessibility to their businesses. This is true for businesses directly adjacent to the LRT construction and for those retail and wholesale businesses that rely in walk-in or drive-up customers. With side running tracks between 400 West and 200 East, both access to parking and actual access to store

entrances will at times be affected. Almost 20 of the structures along this stretch of the 400 South alignment are office buildings, apartments or vacant buildings. There are essentially no through alleys to re-route traffic.

Of the eight eateries and clubs located adjacent to LRT construction, half are located on corners and have secondary access. Of the roughly 45 total establishments between 400 West and State Street, only one-third have access from north-south streets; the other two-thirds rely on 400 South access. This includes the First Security Bank Building at 405 South Main Street, which has its only access to its multi-level parking structure and drive-through banking facilities on 400 South. Roughly 450 employees, 100 tenants, and a busy walk-in customer base are all housed in this location and will need to be accommodated. This parking lot is also used in the evening for patrons of clubs and restaurants along this stretch of 400 South who will need to have access or alternative parking arrangements.

The primary goal during LRT construction will be to work to preserve at least one access at all times for all businesses, or to provide alternative access and parking. Simultaneously, directional signage, both inside and outside the construction site, will be important so clients know in ample time which businesses are open and how to get there.

Mitigation measures taken during LRT construction along 400 South will include maintenance of street lights in front of businesses to prevent an unsafe environment and subsequent vandalism or transient homesteading. Fugitive dust and noise pollution resulting from the use of heavy equipment will need to be controlled. Close and frequent contact with affected merchants will be important to minimize negative impacts and to provide responses in an appropriate and timely manner.

**Erosion, Sedimentation and Water Quality**
Several wetlands, ditch, and stream crossings will require special consideration during the construction process. Cut and fill operations in the vicinity of these waters may contribute minor siltation during construction of bridges. Sediment transport will be much greater during the construction process than after the permanent facility is completed. Best Construction Management Practices and standard erosion protection measures will be used to minimize erosion during this time. Permanent adverse impacts related to construction are not expected.

An erosion control plan will be required as part of the project construction. Temporary erosion control measures may include siltation fence, bale ditch checks, bale diversions, dikes, floating siltation devices, slope drains, and temporary sediment basins. Permanent retention basins may be sized for use as sediment basins during the construction process. Stockpiled or excess material scheduled for removal will require special erosion protection. No storage shall be allowed near watercourses.

Permanent erosion protection measures, including revegetation, landscaping, and riprap, shall be installed prior to removing temporary measures. Sediment due to construction should be removed from permanent retention basins, both existing and proposed, during final cleanup. A major component of permanent sediment control is obtained by directing runoff through retention basins or grassed swales prior to discharging to receiving waters.

Measures shall be taken to minimize undesirable construction impacts on the Jordan River and Surplus Canal. Measures may include temporary erosion control and minimizing the construction time schedule to the extent possible. Special care will be taken to minimize slope failure at these crossings, using both temporary and permanent controls. All necessary permits, including National Pollutant Discharge Elimination System (NPDES) permits will be obtained as appropriate.

Settling basins shall be used for any dewatering systems prior to discharging. Section 5.14 lists potential contamination sites identified during the Phase I and Phase II hazardous waste assessments. Any contaminated groundwater encountered during construction shall be handled according to applicable federal and state regulations.

**Vegetation**

During construction, additional vegetation resources will be disturbed in staging areas, access roads, and other auxiliary areas associated with construction. These vegetation impacts will occur in upland areas and will be temporary. Revegetation and landscaping after completion of construction will replace the vegetation resources in auxiliary disturbance areas. Considering the weedy condition of current vegetation resources in much of the upland area within and adjacent to at least the western end of the project corridor, the vegetation resources of the auxiliary disturbance areas are likely to be improved by revegetation or landscaping. On the eastern end of the proposed transit corridor, implementation of landscaping after construction will restore current conditions with no permanent impacts to vegetation resources in auxiliary disturbance areas.

The Utah Division of Wildlife Resources requested that construction in the east end of the project area avoid any plant stand of Blue Bunch Wheat Grass (*Agropyron spicatum*). The Division doubted whether any stands existed but wants to protect any existing populations. No populations exist within the West-East Corridor.

**Wildlife**

It is important to note that species particularly sensitive to disturbance, such as the interior-forest species of goshawk, elk, lynx, and wolverine do not occur in the project area. There are multiple existing barriers to wildlife movement in the corridor including highways, traffic barriers, as well as the proposed LRT barriers. During the construction period, increased traffic from vehicles and installation of barriers along the length of the corridor may cause an increase in the number of road kills. The barrier may also impede wildlife movement and/or migration of small to medium sized mammals across the corridor. Increased traffic could increase noise, which may disturb wildlife utilizing adjacent habitats. However, increased noise levels would not exceed existing wildlife tolerance levels.

**Water Resources and Floodplains**

During construction, areas near water courses that are subject to surface disturbance during construction are expected to produce runoff with increased sediment loads, which will adversely affect water quality in the canals. Best Management Practices will be implemented to minimize the effects of erosion and sedimentation due to surface disturbance associated with construction. In addition, since expansion of the bridge over the Surplus Canal will require construction within the 100 and 500-year floodplains for the canal, Salt Lake City and Salt Lake County ordinances and regulations for construction within a floodplain will be followed. These regulations outline building methods, materials, flood-proofing, and structural requirements for floodplain construction, as well as specify that the flood capacity of the watercourse and its floodplain will not be diminished by construction.

Excavation during construction of the LRT project is likely to affect the shallow groundwater resources near the western end of the proposed project corridor. In this area, the shallow unconfined aquifer is relatively close to activities and processes occurring at the land surface. This makes the shallow unconfined aquifer more susceptible to many types of contamination. In addition, the extent of the layers separating the shallow, unconfined aquifer from the deep, confined aquifer and their effectiveness as a barrier to contaminant movement are not well known. All activities associated with the LRT project will be implemented using Best Management Practices designed to prevent contamination from reaching the shallow, unconfined aquifer.

Upon completion of construction, all disturbed soils will either be paved, consist of compacted gravel shoulders, or be revegetated and controlled for noxious weeds, thereby reducing the potential for soil erosion and subsequent sedimentation into the canals. The flood capacities of the water courses and associated floodplains will not be affected by the completed project. No long term construction impacts to water resources or floodplains are anticipated.

**Air Quality**

Adverse air quality impacts associated with the construction activities include emissions from vehicles and equipment, and fugitive dust from clearing, excavation, and grading. Vehicular emissions impacts would be temporary and minimized by maintaining traffic flow during construction periods. Contractors will be required to control fugitive dust and airborne particulates as per Utah State Division of Air Quality standards. Some ways to control fugitive dust include applying water to exposed soils, revegetating exposed areas as soon as possible and limiting the extent and duration of exposed areas and material piles.

**Noise and Vibration**

Trucks and machinery used for construction produce noise, which may affect some of the susceptible land use areas during construction. Construction workers can reduce disturbance to neighbors by ensuring that all machinery is equipped with the proper mufflers, that machinery is well maintained, and that noise levels conform to local, state, and federal regulations. Consideration will be given to restricting use of construction equipment during certain hours, depending upon location, as per FTA and FHWA noise abatement standards.

Noise at construction sites is non-steady and intermittent. When construction activity occurs along a right-of-way, as in the case of roadway and LRT track and station construction, long-term noise exposure descriptors are difficult to quantify. Roadway and LRT track and station construction is accomplished in several different phases. These phases and their estimated noise levels at the right-of-way (ROW) can be characterized by Table 5.19-1 (FHWA, 1977).

**TABLE 5.19-1**
**CONSTRUCTION NOISE AT RIGHT-OF-WAY**

| Phase | Leq (h), dBA |
|---|---|
| Clearing and grubbing | 83 |
| Earthwork | 85 |
| Foundation | 83 |
| Superstructure | 83 |
| Base Preparation | 85 |
| Paving | 86 |

Construction Mitigation Measures for Noise. Short-term construction noise impacts are expected. Several possible construction mitigation measures are listed in this section which can be applied when construction activities are within 500 feet of sensitive receptors. Contractors could use newer equipment that is quieter and ensure that all equipment items have the manufacturers' recommended noise abatement measures, such as mufflers, engine covers, and engine vibration insulators. In addition, contractors could consider alternatives to driven piles.

The duration and time of day that construction activities take place can be adjusted to minimize the noise impact on exposed individuals. Salt Lake City construction time limits should be applied. Coordination with Salt Lake City will occur related to times of construction, and will be documented in the Memorandum of Agreement. Activities could be scheduled so that quiet periods are provided. Haul routes could be chosen carefully for material and dump trucks to minimize noise impacts. Temporary, heavy wooden barriers could be used and relocated, as needed, whenever possible.

Good public relations with the community are necessary to minimize the reactions to unavoidable noise. The communities should be notified in advance of the scheduling and importance of the West-East Corridor construction project.

Vibrations may occur as a result of construction practices. These vibrations could result from various activities that include, but are not limited to, pile driving and use of construction equipment. Factors that can affect the degree of vibration are soil type, depth of water table, and proximity to structures. Heavy construction activity near historic buildings and other sensitive receptors will be minimized as much as possible.

**Utilities and Emergency Services Disruption**
Coordination of utilities and emergency services will occur as far in advance of construction as possible to minimize conflicts and disruption of service to the area. Business and residential customers would receive ample notification to plan around utility disruptions. Emergency services will be affected during construction because access will change and some streets will be closed off. In addition, higher volumes on local streets and congested conditions along the alignment during construction would also present impediments to emergency vehicles. Coordination between UTA, Salt Lake City, UDOT, contractors, and the emergency services is important to keep emergency personnel informed so they can perform their duties properly.

**Disposal of Excess Material**
The West-East LRT project will involve excavation of soils and removal of pavement. If it becomes necessary to dispose of unsuitable material or removed pavement, this will be done in an environmentally-responsible manner. Materials will be salvaged for reuse whenever reasonable. The source of borrow material is unknown at this time. Borrow material will be handled in a manner consistent with UDOT erosion control practices.

**Traffic Delays and Detours**
Efforts will be made to keep such disruptions to a minimum. This might require limiting some construction to off-peak hours. Staging of construction will help minimize overall impacts on a specific area. A public information outreach program will be instituted to help make motorists aware of alternative travel options.

Contractors will be required to conduct their operations in a manner that results in a minimum amount of inconvenience and delay to local and through traffic. Access to adjacent properties shall be maintained to the extent practical. Detours and alternate routes shall be adequately signed, and barricades, lighting, and traffic control devices shall be used to protect the construction work and public safety.

# SECTION 6
# FINANCIAL ANALYSIS AND EVALUATION

## 6.0 INTRODUCTION

This section presents a financial analysis and evaluation of the proposed West-East Light Rail Transit project. The purpose of this section is to assess the Utah Transit Authority's (UTA) financial capacity to construct and operate the West-East Light Rail system (W-E LRT) while continuing to operate, maintain, and expand its existing transit services in the region. An assessment is also provided of UTA's ability to assure adequate debt service coverage as required by bond covenant for bonds issued in 1997 and 1998 for the North-South LRT line, and for a new subordinated bond UTA proposes to issue in 2000 for the West-East LRT line.

Of key interest to decision-makers is the adequacy and reliability of the revenues available to UTA over the 1997-2017 period for Operations, Maintenance, and Administration (O&M) and for Capital Costs in comparison to UTA's projected costs for O&M and for its baseline Capital Program including the West-East LRT Project. Also of interest are changes in the level of UTA's annual Capital Reserve, or the excess of total annual operating and capital revenues over total annual operating, capital, and debt service costs. This measure serves as a barometer, indicating the status and direction of UTA's financial robustness. An additional factor is whether UTA will have sufficient annual Net Revenues for Payment of Debt Service and Capital Costs. Expressed as the excess of annual operating revenues over annual operating costs, Net Revenues must be sufficient to assure a minimum annual coverage level of 1.25 times the annual debt service required to repay principal and interest on the Authority's outstanding bonds.

The major findings of the financial analysis are:

- Assuming voter approval of an additional ¼ percent sales tax in 2000, UTA will have adequate financial capacity to fund the West-East LRT project construction and operation while continuing to operate the new North-South LRT project and to expand operation of its bus services throughout the 1997-2017 project period.

- Throughout the 1997-2017 period, UTA will have sufficient annual Net Revenues for payment of debt service on its outstanding bonds.

- In the absence of the proposed additional ¼ percent sales tax, the level of these Net Revenues combined with UTA's capital grant revenues would be insufficient to pay for both debt service requirements and the Authority's operating needs related to the West-East LRT line. The additional sales tax will assure the Authority adequate funding for the West-East line and for other future capital projects proposed in the long range transportation plan recently adopted by the Wasatch Front Regional Council.

- If voter approval of an additional ¼ of 1 percent sales tax did not occur in 2000, UTA would return to the voters in a subsequent year. For sensitivity testing purposes, an alternative financing plan was considered whereby voter approval was deferred until 2006. Under this scenario, an annual subsidy of $5 million would be required for the first five years of operation of the West-East LRT line over the 2002-2006 period. UTA is seeking the commitment of these funds from a variety of sources, including the State of Utah, City of Salt Lake, and other public and private sources.

The balance of this Section is organized as follows:

- Section 6.1 describes the baseline revenues available to UTA over the 1997-2017 period for O&M and Capital.
- Section 6.2 discusses UTA's existing and projected expenditures for O&M and for its baseline Capital Program including the West-East LRT project.
- Section 6.3 summarizes the proposed capital financing plan for the West-East LRT project.
- Section 6.4 presents the results of the financial analysis. First, a description is given of the model used to evaluate UTA's financial performance. This is followed by a summary evaluation of UTA's financial capacity to provide expanded transit service in the West-East Corridor while meeting its operating expenses and debt coverage requirements.
- Section 6.5 focuses on UTA's Projected Annual Debt Service Coverage and the Net Revenues for Payment of Debt Service and Capital anticipated to be available annually through 2017.
- Section 6.6 summarizes projections through 2017 regarding UTA's Capital Reserves.
- Section 6.7 concludes with the Capital Cost estimate for the West-East Corridor LRT project.

## 6.1 BASELINE REVENUE SOURCES

The cash flow analysis for the West-East Corridor assumes a consistent base of funding for operations and maintenance of the current system, as well as a defined cost and construction schedule for the West-East Corridor project. This section describes the baseline revenues available to UTA over the 1997-2017 period for O&M and Capital, and the assumptions used in the cash flow analysis.

UTA receives revenues from a number of federal, state, and local sources. These include revenues that are unrestricted as to use, revenues that are restricted to operations and maintenance, and revenues that are restricted to use for capital projects. UTA typically commits its unrestricted revenues and its revenues restricted to O&M to cover its operating costs in advance of other expenditures. Any revenues beyond those needed for O&M is considered Net Revenues Available for Debt Service and Capital, and is used for those purposes.

### 6.1.1 Revenues for Operations and Maintenance

The ongoing operating and maintenance costs of the UTA base system and the West-East Corridor project can be financed from existing revenue sources supplemented by an increase in UTA's existing ¼ percent sales tax. An additional ¼ percent sales tax is proposed for voter approval in 2000, with revenue collection to begin in 2001 throughout the 1997-2017 period. Including the additional sales tax, seven types of revenues are available to UTA for O&M purposes:

- Bus Passenger Fares – including fares from special services
- LRT Passenger Fares
- Sales Tax Revenues
- Federal Funds for Preventive Maintenance
- Interest on Capital Reserves
- Interest on Debt Service Reserve Funds
- Other Revenues – including Advertising

Historically, Sales Tax Revenues and Bus Passenger Fares have constituted the two largest contributors to UTA's O&M revenues. Prior to 1998, these two sources provided roughly 76 percent and 16 percent of total revenues respectively. All other revenues provided less than 10 percent of UTA's revenues for O&M. Beginning in 1998, with the change in federal law allowing federal Section 5307 formula capital funds to be used for preventive maintenance activities, federal funds used for preventive maintenance will constitute the second largest contributor to UTA's O&M revenues, replacing Bus Passenger Fares in relative importance.

The sections below describe UTA's O&M revenue sources, by type. Table 6.1-1 summarizes historical trends in UTA's O&M revenue sources. Current and projected O&M revenues over the 1997-2017 period are shown in Table 6.1-2.

**Bus Passenger Fares**

Bus Passenger Fares were projected using two different approaches that yielded consistent results. Under the first approach, bus passenger fares were projected based on UTA's 1999 Proposed Budget, assuming annual increases in ridership of 2 percent commensurate with population and employment growth in the region, and increases in average system fare of 10 percent every third year beginning in 2001 to keep pace with inflation. Farebox revenues were also projected using the ridership forecasts prepared for the West-East Corridor MIS/DEIS (July 1997) and average system fare per passenger, escalated to match system-wide fare increases every third year through 2017. The compound annual growth rate in passenger fare revenues over the 1998-2017 period resulting from these passenger and fare increases is 5.64 percent.

In comparison to UTA's past performance, the 5.64 percent annual growth rate in bus passenger fare revenues is conservative. As shown in Table 6.1-1, historically, UTA's Bus Passenger Revenues have increased at a compound annual growth rate (CAGR) of 7.05 percent per year over the 1986-1998 period. In 1997, bus passenger fares increased 13.01 percent over the prior year due in part to a June 1997 fare increase. In 1998, fare revenues increased 4.6 percent over 1998. For 1999, the Authority projects a minimal increase in fare revenues, as ridership is projected not to increase due to the inconvenience of rebuilding Utah highways including I-15.

**LRT Passenger Fares**

LRT passenger fare collection will begin in 2000 with the initiation of North-South LRT service, followed by initiation of the West-East LRT service in 2002. For the North-South LRT service, fare revenues are anticipated to cover 30 percent, 35 percent, and 40 percent of its annual operating costs in years 1, 2, and 3 of service. Farebox receipts are then assumed to remain at the 40 percent farebox recovery level through 2017. For the West-East LRT service, farebox receipts are

**TABLE 6.1-1**
**UTAH TRANSIT AUTHORITY**
**REVENUES FOR OPERATIONS AND MAINTENANCE: 1986 - 1998**

| | 1986 Actual | 1987 Actual | 1988 Actual | 1989 Actual | 1990 Actual | 1991 Actual | 1992 Actual | 1993 Actual | 1994 Actual | 1995 Actual | 1996 Actual | 1997 Actual | 1998 Projected | 1986-98 CAGR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **O&M REVENUES** | | | | | | | | | | | | | | |
| PASSENGER REVENUES (BUS) | $5,495 | $5,381 | $5,628 | $6,122 | $6,818 | $8,267 | $8,633 | $8,764 | $8,970 | $9,737 | $10,526 | $11,895 | $12,442 | |
| % CHANGE | | -1.88% | 4.38% | 8.78% | 11.37% | 21.55% | 4.17% | 1.52% | 2.35% | 8.55% | 8.10% | 13.01% | 4.60% | 7.05% |
| PASSENGER REVENUES (LRT) | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | |
| % CHANGE | | | | | | | | | | | | | | |
| SALES TAX | $23,541 | $23,131 | $24,130 | $25,603 | $28,162 | $30,470 | $32,738 | $37,321 | $41,214 | $47,003 | $50,716 | $53,024 | $56,550 | |
| % CHANGE | | -1.74% | 4.32% | 6.10% | 10.00% | 8.20% | 7.44% | 14.00% | 10.43% | 14.05% | 7.90% | 4.55% | 6.65% | 7.56% |
| FED OPERATING FUNDS | $5,052.14 | $4,911 | $4,802 | $4,762 | $4,710 | $4,955 | $4,779 | $4,884 | $4,441 | $2,235 | $2,714 | $2,347 | $15,525 | |
| % CHANGE | | -2.80% | -2.21% | -0.83% | -1.11% | 5.22% | -3.55% | 2.20% | -9.08% | -49.66% | 21.40% | -13.51% | 561.48% | 9.81% |
| INTEREST CAPITAL RESERVES | $1,824 | $1,602 | $1,976 | $2,628 | $2,518 | $2,872 | $2,002 | $1,635 | $1,539 | $2,029 | $2,021 | $2,412 | $3,543 | |
| % CHANGE | | -12.16% | 23.30% | 33.01% | -4.18% | 14.06% | -30.32% | -18.31% | -5.87% | 31.84% | -0.40% | 19.35% | 46.88% | 5.69% |
| OTHER REVENUES | $190 | $1,127 | $306 | $333 | $353 | $346 | $482 | $618 | $653 | $812 | $1,429 | $1,428 | $1,284 | |
| % CHANGE | | 491.57% | -72.81% | 8.58% | 6.17% | -2.07% | 39.31% | 28.30% | 5.61% | 24.30% | 76.09% | -0.05% | -10.10% | 17.24% |
| TOTAL | $35,569 | $36,162 | $36,842 | $39,448 | $42,562 | $46,931 | $48,634 | $53,223 | $56,816 | $61,816 | $67,405 | $71,107 | $89,702 | |
| % CHANGE | | 1.67% | 1.88% | 7.07% | 7.89% | 10.27% | 3.63% | 9.44% | 6.75% | 8.80% | 9.04% | 5.49% | 26.15% | 8.01% |

Source: Utah Transit Authority

**Table 6.1-2**
**Total Revenues by Source - 1997-2017**
**(Inflated dollars, $000)**

| | | |
|---|---|---|
| ***O&M REVENUES*** | | |
| PASSENGER AND SPECIAL SERVICE FARES (BUS) | $ | 460,670 |
| PASSENGER FARES (LRT) | $ | 153,546 |
| SALES TAX REVENUES | $ | 3,666,213 |
| FEDERAL PREVENTIVE MAINTENANCE (FTA SECTION 5307 | $ | 449,887 |
| INTEREST INCOME | $ | 576,518 |
| DEBT SERVICE RESERVE FUND, INTEREST INCOME | $ | 3,143 |
| OTHER REVENUES | $ | 32,625 |
| **TOTAL** | $ | 5,342,601 |
| ***CAPITAL REVENUES*** | | |
| FTA SECTION 5307 CAPITAL | $ | 116,593 |
| FTA SECTION 5309 CAPITAL FOR BUS & OTHER* | $ | 168,539 |
| FTA SECT 5309 CAPITAL, N-S LRT CONSTRUCT | $ | 208,702 |
| FTA SECT 5309 CAPITAL, W-E LRT PE | $ | 4,963 |
| FTA SECT 5309 CAPITAL, W-E LRT CONSTRUCT* | $ | 471,000 |
| FTA SECT 5309 RAIL MODERNIZATION | $ | 20,901 |
| BOND LONG TERM | $ | 27,740 |
| SUBORDINATED BONDS | $ | 115,000 |
| FTA REIMBURSEMENT (FINANCING COSTS) N-S | $ | 8,403 |
| FTA REIMBURSEMENT (FINANCING COSTS) W-E | $ | 9,000 |
| OTHER CONTRIBUTED CAPITAL | $ | 34,352 |
| ENDING CAPITAL RESERVE | $ | 1,588,018 |
| **TOTAL** | $ | 2,773,212 |
| ***TOTAL REVENUES - 1997-2017*** | **$** | **8,115,813** |

* TEA 21 UTA Authorization

assumed to cover 25 percent of annual LRT operating costs due to the high rate of transfers projected to the West-East LRT line from UTA's North-South LRT line and from bus services.

**Sales Tax Revenues**

Under Section 59-12-501 of the Utah State Code, UTA receives ¼ of 1 percent sales tax on all retail sales of tangible personal property, services, and meals purchased within its affiliated taxing districts/jurisdictions.

With Sales Tax historically comprising 76 percent of UTA's annual O&M revenues and projected to provide 64 percent of annual revenues beginning in 1998, UTA is highly sensitive to changes in the level and rate of growth of this revenue source. As shown in Table 6.1-1, over the 1986-1998 period, UTA's Sales Tax revenues increased at a compound annual rate growth rate of 7.58 percent, with rates in the last five years higher than the rates of the prior five years. In the most recent 5 years (1993-1998), sales tax revenues grew at a CAGR of 8.32 percent, with rates exceeding 10 percent in two of these five years. A 6.20 percent increase in sales tax receipts is projected in 1999, consistent with UTA's 1999 Budget.

Sales Tax revenue projections to 2005 were prepared by the Utah State Office of Planning and Budget (OPB.) based on a time-series econometric model driven chiefly by changes in population, employment, and personal income. Based on these forecasts, Sales Tax revenues are projected to increase an average of 6.33 percent per year over the 1999-2005 period. A more conservative approach is assumed in the cash flow analysis, however. Beyond 2002, sales tax revenues are assumed to roughly keep pace with population and employment growth and inflation, with revenues increasing 4.5 percent per year over the 2003-2017 period.

Starting in the year 2000, UTA will need to take action to increase available funding. This will be necessary in order to fund increased levels of bus service and to implement the long-range transportation plan recently adopted by the Wasatch Front Regional Council. For purposes of this analysis, it was therefore assumed that action would be taken to increase the current ¼ cent sales tax to ½ cent, with increased revenue starting in 2001.

**Federal Funds for Preventive Maintenance**

For purpose of this analysis, UTA is assumed to continue receiving federal funding for maintenance related uses through 2017. Beginning in 1998, these funds would be derived from the Federal Transit Administration (FTA) Section 5307 (formerly Section 9) program, and would consist of formula capital grant funds used for "preventive maintenance" related activities.

Per FTA direction, and as proposed in UTA's 1999 Budget, roughly $15.53 million in Section 5307 Capital grant funds will be used for preventive maintenance in 1998. These funds are assumed to cover 80 percent of UTA's preventive maintenance costs. Through the 1998-2003 period of the new Transportation Equity Act for the 21st Century (TEA 21), the level of such funds assumed are based on FTA estimates. Beginning with the next federal transportation authorization period in 2004, Section 5307 revenues are assumed to grow at 3 percent per year to keep pace with inflation.

With the initiation of LRT service on the North-South line in 2000, UTA would enter into the "Fixed Guideway Tier" of cities qualifying for additional Section 5307 formula funds. While no additional Section 5307 funds have been assumed in the cash flow analysis, UTA could potentially receive a larger annual formula allocation of Section 5307 funds than was assumed due to the addition of directional miles of LRT service.

**Interest on Capital Reserves and Debt Service Reserve Fund**
UTA is assumed to accrue interest on its annual Capital Reserves at a conservative rate of 4.5 percent. Interest earnings are also assumed to accrue annually on UTA's Debt Service Reserve Fund from three bonds: its existing 1997A and 1998A Series bonds, and from a new Subordinate Bond that would be issued in 2000 (with repayment in 2004).

**Other Revenues – including Advertising**
This revenue consists primarily of Advertising. For projection purposes through 2017, the annual level of $1.284 million proposed in UTA's 1998 Budget is assumed, with annual revenues increased 3 percent per year for inflation.

### 6.1.2 Revenues for Capital

Ongoing capital expenditures for UTA's base system are projected to be financed from the eight existing capital revenue streams listed below.

- Net Revenues for Debt Service and Capital Costs
- FTA Section 5307 (formerly Section 9) Capital
- FTA Section 5309 (formerly Section 3) Capital for Bus and Other Capital
- FTA Section 5309 Capital for North-South LRT Construction
- Bond Proceeds from Long Term and Subordinate Bonds
- Federal Reimbursement of Financing Costs
- Net Capital Contribution/Use of Reserves
- Capital Reserves

**Net Revenues for Debt Service and Capital Costs**
Net Revenues for Debt Service and Capital Costs refers to the excess of annual operating revenues over annual operating costs. These revenues are pledged first to cover any outstanding debt service, and then may be used for capital needs. Throughout the 1997-2017 period, UTA will have positive Net Revenues available for these purposes.

**FTA Section 5307 (formerly Section 9) Capital**
Grant obligations through the FTA Section 5307 (formerly Section 9) formula grant program assume first receipt of funds from UTA's existing and committed capital grants. For new FTA Section 5307 formula grant funds, three uses are assumed: Preventive Maintenance and Planning – both of which are for O&M related purposes - and Capital, with Capital the last use to be funded. For the 1998-2003 period, UTA's total annual Section 5307 funding is assumed to increase annually, commensurate with the estimated formula grant allocations in TEA 21. Beyond 2003, the level of these funds is assumed to increase 3 percent per year for inflation.

**FTA Section 5309 (formerly Section 3) Capital for Bus and Other Capital**
FTA Section 5309 Bus and Other Capital grants assumed through 2002 are based on committed projects in the 1997 adopted Transportation Improvement Program and on grants awarded in 1998. Upon completion of UTA's existing Section 5309 grants, it is assumed that over the 2004-2017 period UTA will receive a level of discretionary grant funding that is conservatively consistent with UTA's historical grant levels from this program, or approximately $5 million per year. These funds

are assumed to increase 3 percent per year for inflation. FTA Section 5309 Bus grant funds would be used toward UTA's capital costs for bus replacement and bus fleet expansion.

**FTA Section 5309 Capital for North-South LRT Construction**
Under a Full Funding Grant Agreement between UTA and FTA, Federal Section 5309 capital grant funds have been and will be paid to UTA over the Federal Fiscal Year 1995-2000 period to reimburse UTA for the costs of North-South LRT construction and implementation, and for associated financing costs incurred for the North-South LRT project. UTA will receive a total of $241,393,528 in Section 5309 New Starts funding for the North-South LRT project. Of this total, $232,990,000 is for capital with the balance of funds to cover a portion of the financing costs incurred.

**FTA Section 5309 Rail Modernization Funds**
Federal funding through the FTA Section 5309 Rail Modernization Program is assumed to begin in 2007, after seven years of LRT rail service. These funds are assumed to provide 80 percent of the capital cost of LRT vehicle overhaul and maintenance and of right-of-way capital maintenance. On an annual basis, these funds are roughly $250,000 per year, with roughly $1 million assumed every fifth year for vehicle and track overhaul.

**Bond Proceeds from Long Term and Subordinate Bonds**
UTA has two existing bonds issued in 1997 and 1998 to provide up-front capital funding for the North-South LRT project. The first is a $27,740,000 Sales Tax and Transportation Revenue Bond issued in 1997 that will expire in 2023. The second is a $65,000,000 Subordinate Bond issued in 1998 to be repaid in 2000 with federal grant funds. Upon repayment of the existing Subordinate Bond, a new Subordinate Bond of $50 million will be needed for grant anticipation purposes for the West-East LRT project. This Subordinate Bond will be repaid at the completion of construction of the West-East LRT project.

**Federal Reimbursement of Financing Costs**
Under its existing Full Funding Grant Agreement for the North-South LRT project, UTA currently receives (and will continue to receive) federal assistance to repay its financing costs. UTA may receive up to a maximum of $19,310,528 with these revenues providing for 80 percent federal reimbursement of interest costs incurred on debt for the North-South LRT project.

**Net Capital Contribution/Use of Reserves**
These funds consist chiefly of federal Congestion Mitigation and Air Quality (CMA) funding of roughly $1 million per year and local contributions.

**Capital Reserves**
UTA's Capital Reserve refers to its annual surplus of revenues over costs. For 1997 and 1998, the Beginning Capital Reserve is consistent with UTA's Annual Financial Statements. For 1999, the Beginning Capital Reserve is consistent with UTA's proposed Annual Budget. Beginning in 2000, the Capital Reserve is computed after consideration of all costs and revenues.

## 6.2 EXISTING AND PROJECTED EXPENDITURES

Table 6.2-1 summarizes UTA's projected operating and capital expenditures for the 1997-2017 period in year-of-expenditure dollars.

Existing and projected expenditures of UTA consist of costs associated with Operations and Maintenance of its bus and LRT systems, and its ongoing and programmed capital expenditures. Expenditure projections are based on the proposed UTA budget for 1999, adopted UTA 1998 Budget; adopted 1997 Transportation Improvement Program; Long Range Plans for the Salt Lake, Provo, and Ogden areas; and most recent cost estimates for the North-South and West-East LRT projects. For purposes of this analysis, the base program assumes no major service increases or additional rapid transit corridors will be constructed beyond the West-East LRT project. While the additional ¼ percent sales tax will provide revenues to accommodate such improvements, the recommendation and advancement of specific new major capital projects is at the discretion of the Authority.

### 6.2.1 Operations and Maintenance Costs

Operations and Maintenance costs were projected for both UTA's bus service and for LRT services that will be initiated in the Year 2000. Key assumptions with regard to these services are discussed below.

**Bus O&M Costs**

Bus O&M costs for 1997 and 1998 reflect actual costs incurred by UTA. For the 1999, costs are based on the Authority's proposed 1999 budget. For the 2000-2017 period, these costs are based on projections of miles of service for the Salt Lake, Provo, and Ogden service areas and on projected cost per mile of service. Mileage growth assumptions are that the new sales tax would accommodate a 1.00 percent annual increase in the miles of bus service within the Salt Lake area. Within the Provo and Ogden service areas, miles of service are assumed to grow at 1.87 percent and 1.78 percent per year annually, based on the adopted Long Range Plans for these areas. The resulting miles of service for 2017 is consistent with the inputs to the Bus O&M Cost modeling conducted for the West-East Corridor MIS/DEIS.

UTA's bus cost per mile is based on the 1999 proposed budget, and then increased at 4.5 percent per year for real growth and inflation. The cost per bus mile assumed in the projections is consistent with the results of the Bus O&M Cost modeling conducted in conjunction with the West-East Corridor MIS/DEIS and with past trends. Historically, over the 1985-1999 period, UTA's O&M cost per mile increased at a CAGR of 3.54 percent per year. Over the most recent five years, UTA's O&M cost per mile has increased at a significantly higher rate of 6.77 percent due to renegotiation of labor agreements and the provision of service amenity and safety projects that have served to increase cost without a commensurate increase in the number of miles of service. The largest annual increase will occur in 1999, with a 12.7% increase.

**LRT O&M Costs**

LRT O&M costs were projected for the North-South LRT project and for the proposed West-East Corridor LRT service.

For the North-South LRT project, O&M cost was assumed to be roughly \$8.5 million (in 1997 dollars), with this amount escalated to roughly \$9.02 million in year-of-expenditure dollars in 2000.

**Table 6.2-1**
**Total Expenditures 1997-2017**
**(Inflated dollars, $000)**

| | | **$(000** |
|---|---|---|
| ***O&M COSTS*** | | |
| BUS OPERATION, MAINTENANCE, AND ADMINISTRATION | $ | 2,724473 |
| LRT OPERATION, MAINTENANCE, AND ADMINISTRATION | $ | 460317 |
| **TOTAL** | $ | 3,184791 |
| ***CAPITAL COSTS*** | | |
| BUS & OTHER CAPITAL | $ | 701921 |
| LRT CAPITAL MAINTENANCE | $ | 26253 |
| N-S LRT CONSTRUCTION COSTS | $ | 272841 |
| BOND DEBT SERVICE | $ | 55260 |
| WEST-EAST LRT PE | $ | 8400 |
| WEST-EAST LRT CONSTRUCTION | $ | 471000 |
| REPAYMENT OF SUBORDINATED DEBT | $ | 115040 |
| **TOTAL** | $ | 1,650714 |
| **Total Expenses - 1997-2020** | **$** | **4,835505** |

With regard to level of service, the analysis assumes 990,500 miles of North-South LRT service in the year 2000, and 1,035,800 miles per year beginning in 2001, through 2017. This is consistent with the LRT O&M cost model assumption of service levels beginning in the fifth year of operation of the North-South line.

For the West-East Corridor LRT service, O&M cost was assumed to be roughly $7.1 million in 1997 dollars, with these costs escalated to roughly $8.0 million in year-of-expenditure dollars in 2002. With regard to level of service, the analysis assumes 718,000 miles of LRT service annually in 2002-2005, and 754,000 miles per year beginning in 2006, through 2017. This is consistent with the LRT O&M Cost Model assumption of service levels for the corridor.

With respect to LRT O&M cost per mile, these costs are consistent with the LRT O&M cost modeling for the North-South project, with cost per mile slightly higher for the latter. LRT O&M cost per mile is increased 4.5 percent annually for real growth and inflation, consistent with the Bus O&M cost assumption. In addition, consistent with the LRT O&M cost modeling effort, a higher cost per mile is assumed beginning in Year 5 to reflect the higher cost of operating equipment that is no longer new.

### 6.2.2 Capital Costs

Capital costs considered include the following costs shown in Table 6.2-1:

- Bus and Other Capital
- LRT Capital Maintenance
- North-South LRT Construction
- Bond Debt Service
- West-East LRT Preliminary Engineering
- West-East LRT Construction
- Repayment of Subordinated Bonds

Capital costs were derived from review of UTA's historic expenditure patterns, bus acquisition and replacement schedules, the most current North-South and West-East Corridor LRT implementation schedules, and the capital program proposed in the federal TIP. It should be noted that a Base Level capital program was assumed. This Base Level capital program is similar to the Low Bus scenarios proposed in the Long Range Plans prepared by Wasatch Front Regional Council and Mountain Lands Association of Governments.

**Bus and Other Capital**

A major component of UTA's capital program is Bus Expansion and Replacement. The analysis assumes a 12 year bus replacement cycle, average cost per vehicle (fleet average, including regular buses, Flextrans, and articulated) of $292,900 (in 1999 dollars), and 38,700 miles per bus per year. In addition to bus replacement and expansion, Facility and Miscellaneous Capital Projects are also assumed, starting in 1997 at roughly $5 million per year escalated at 3 percent for inflation. Currently programmed and committed capital projects in the Authority's proposed 1999 budget and in the TIP are also included, including information and communication projects, facilities repair and upkeep, Intelligent Transportation System projects, intermodal centers and park-and-ride lots, and other major strategic projects.

**LRT Capital Maintenance**
The analysis assumes that there would be additional costs for capital maintenance of the North-South LRT and West-East LRT lines, including minor and major vehicle upgrades on a 7-year and 15-year cycle respectively, and annual costs for right-of-way capital maintenance.

**North-South LRT Construction**
A total of $272.841 million is anticipated to be expended within the 1997-2017 period for the North-South LRT project, with costs occurring in 1997-2000.

**Bond Debt Service**
In addition to the bus and LRT capital costs, three Bond Debt Service cost streams are considered: one for debt service payments on the Sales Tax and Transportation Revenue Bonds UTA issued in 1997, one for debt service payments on the Subordinate Bonds UTA issued in 1998 for the North-South project, and one for debt service payments on a new Subordinate Bond UTA is assumed to issue in 2000 for the West-East Corridor.

**West-East LRT Preliminary Engineering and Construction**
The analysis assumes the expenditure of roughly $8.40 million for preliminary engineering of the West-East Corridor LRT line, with costs occurring in 1998 and 1999. UTA is expected to receive $4.96 million in Section 5309 New Start grant funds in 1998 and 1999 to cover a portion of these costs. The balance has been funded primarily with local funds provided by Salt Lake City and the LDS Church.

Construction of the West-East Corridor LRT is assumed to occur in 1999-2002 at a cost of roughly $471.00 million in Year of Expenditure dollars (escalated from $452.70 million in 1998 dollars). Including financing costs of $9.00 million, the total cost of the West-East LRT is $480.00 million in Year of Expenditure dollars. As discussed in Section 6.3 following, these costs would be completely funded with FTA Section 5309 New Start grant funds or a special Olympics Infrastructure fund.

**Repayment of Subordinated Debt**
Over the 1997-2017 period, UTA is expected to repay the $65 million in Subordinated Debt issued in 1998. This repayment would occur in Year 2000. Also in 2000, UTA may authorize a new Subordinate Bond for $50 million, with repayment anticipated in 2004.

## 6.3 PROPOSED CAPITAL FINANCING PLAN FOR THE WEST-EAST CORRIDOR

The recommended financing plan for the West-East Corridor assumes that UTA will continue to finance the West-East LRT line from project appropriations authorized in Section 3030(a) of TEA-21, and if necessary, from funds authorized in Section 3030(c)(2)(B) and Section 1223(e) and (f) for transportation projects related to the Salt Lake City Olympic Games. In Section 3030(c)(2)B, the Congress defined highway, aviation and transit projects related to the Winter Games a "program of projects" that authorizes the overmatch of one project, such as the re-construction of I-15, to be credited to the match of another project, such as the West-East LRT. The overmatch on I-15 is expected to exceed $500 million, far more than is needed to provide the 20% credit for West-East. In addition, Congress, in the FY 1999 Omnibus Appropriations Bill, included the same "program of projects" language for the West-East project. UTA expects provision to be included in the Transportation Appropriations bills for FY 2000 and beyond. The Federal source for the project is anticipated to provide 100 percent of the capital costs, with transportation expenditures for other capital projects within the UTA service area and/or by Utah Department of Transportation considered as match.

Table 6.3-1 presents the proposed capital financing plan for the West-East Corridor LRT project. As shown in the table, preliminary engineering is expected to be completed in1998 and early 1999, with final engineering and construction occurring in 1999-2002. Initiation of revenue service is anticipated for December 2001.

To accommodate the accelerated implementation schedule for the West-East Corridor LRT project, UTA is expected to receive federal revenues for preliminary engineering over the 1998 and 1999 period. Matching funds for the PE effort would be provided by the City of Salt Lake and through UTA's Capital Reserve funds. Execution of a Full Funding Grant Agreement (FFGA) between FTA and UTA will be required to assure a flow of federal funds commensurate with final engineering and construction. Even with such an agreement in place, UTA is expected to issue new Subordinate Bond for $50 million in anticipation of federal grant receipts. To reimburse UTA for the costs associated with financing the subordinated debt, the FFGA would include provision for federal assumption of UTA's financing costs.

## 6.4 RESULTS OF THE FINANCIAL ANALYSIS

The following section summarizes the results of the financial analysis. First, an overview is provided of the cash flow model used in the analysis. This is followed by a summary of major findings from the analysis of UTA's financial capacity to construct and operate the West-East Corridor LRT project while continuing to implement and expand its existing base transit system.

### 6.4.1 Overview of Cash Flow Model

The cash flow model used in the financial analysis focuses on the UTA's historical performance through 1998, and on the forecast period of 1999-2017. The model reflects system-wide costs and revenues for the entire UTA service area. Costs and revenues are assumed on an accrual basis in order to provide greater consistency with UTA's annual financial statements. Both costs and revenues are reported in year-of-expenditure dollars, and include inflation (rate of 3 percent per annum).

The model consists of four basic components: Operating Costs, Operating Revenues, Capital Costs, and Capital Revenues. Two factors of key interest for tracking UTA financial performance are Net Revenues for Payment of Debt Service and Capital Costs - that is, the differential between operating costs and revenues – and the Annual Capital Reserve remaining after all costs and revenues are included. The former is of particular importance with regard to debt service coverage while the latter is of particular importance with regard to financial capacity for future service expansion and major capital costs. In addition to Annual Capital Reserve, UTA has established policy mandates regarding the protection of Restricted Reserve Accounts for its Debt Service Reserve, Operating Reserve, and Risk Reserve. Thus, UTA's policy mandates require that sufficient Capital Reserves be available annually to provide for UTA's Restricted Reserve requirements.

**Table 6.3-1**
**West East Corridor Capital Finance**
**( Inflated Dollars $000)**

| | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | Total |
|---|---|---|---|---|---|---|---|---|
| **Cost** | | | | | | | | |
| Construction | | $ 23,550,000 | $ 164,850,000 | $ 188,400,000 | $ 94,200,000 | $ - | $ - | $ 471,000,000 |
| Bond Debt Service | | | $ 1,500,000 | $ 2,250,000 | $ 2,250,000 | $ 2,250,000 | $ 750,000 | $ 9,000,000 |
| Bond Repayment | | | | | $ - | $ - | $ 50,000,000 | $ 50,000,000 |
| **Total Cost** | **$ -** | **$ 23,550,000** | **$ 166,350,000** | **$ 190,650,000** | **$ 96,450,000** | **$ 2,250,000** | **$ 50,750,000** | **$ 530,000,000** |
| **Revenue** | | | | | | | | |
| FTA Section 5309 Construction* | | $ - | $ 150,000,000 | $ 125,000,000 | $ 100,000,000 | $ 67,000,000 | $ 29,000,000 | $ 471,000,000 |
| Series 2000A Subordinate Bond | | | $ 50,000,000 | | | | | $ 50,000,000 |
| FTA Reimbursement of Financing Cost | | | $ 1,500,000 | $ 2,250,000 | $ 2,250,000 | $ 2,250,000 | $ 750,000 | $ 9,000,000 |
| **Total Revenue** | **$ -** | **$ -** | **$ 201,500,000** | **$ 127,250,000** | **$ 102,250,000** | **$ 69,250,000** | **$ 29,750,000** | **$ 530,000,000** |

* Or a Special Olympic Infrastructure Fund

### 6.4.2 Financial Capacity

Table 6.4-1 summarizes the results of the annual cash flow analysis. Through the 1997-2017 period, the table summarizes and contrasts annual O&M costs to annual O&M revenues, and indicates the Net Revenues Available for Debt Service and Capital. Also indicated is the level of coverage that these annual Net Revenues would provide for the annual financing costs that UTA is required to pay for its outstanding bonded indebtedness.

The table also summarizes and contrasts annual capital costs to annual capital revenues, and indicates the annual Capital Reserve that remains available to UTA to meet its Restricted Reserve policy mandates and/or provide for future system needs.

As an alternative to the proposed Financing Plan for the West-East LRT line, an alternative scenario was evaluated whereby voter approval of an additional ¼ of 1 percent Sales Tax was deferred for seven years until 2006. This scenario assumed the commitment of $5 million in operating support from a combination of State, local, and private sources for the first five years of operation of the West-East line over the 2002-2006 period, followed by voter approval of a sales tax measure in 2006. Under this scenario, UTA demonstrated financial capacity to construct and operate the West-East line while continuing to operate the North-South LRT line and existing bus services assuming 1) no increase in miles of bus service within the Salt Lake UZA until 2007, and 2) containment of the rate of growth of O&M cost/mile at 3.75% per year until the sales tax increase is realized.

### 6.4.3 Key Findings

The key findings of the financial analysis are:

- **With voter approval of a ¼ of 1 percent increase in the sales tax, UTA will have the financial capacity to fund the West-East LRT project construction and operation.**

  Using existing revenues supplemented by a ¼ of 1 percent increase in the sales tax to be submitted for approval by District-wide voters in 2000, UTA will have the financial capacity to fund the West-East LRT line construction and operation while continuing to operate the new North-South LRT service and expand bus services throughout the 1997-2017 project period.

- **The sales tax increase will enable UTA to implement other major investment projects recommended in the Long Range Transportation Plans adopted by Wasatch Front Regional Council and Mountain Lands Association of Governments.**

  With the increased revenues for both capital and for operations and maintenance provided by the increased sales tax, UTA will have the ability to move forward with additional major capital investment projects to enhance mobility within various travel corridors within the District. A major objective of increasing the sales tax is to provide the Authority with the financial resources to implement the recommendations of the adopted Long Range Transportation Plans for the Salt Lake, Ogden, and Provo areas. As illustrated in Figure 6.4-1, even with full implementation and operation of the West-East and North-South LRT lines and expansion of system-wide bus services, the Authority's annual Capital Reserve will continue to grow, and will build to $1.728 billion by 2017. The existence of a growing capital reserve will allow the Authority to strategically select additional major capital projects for implementation.

TABLE 6.4-1
FINANCIAL PLAN FOR THE UTAH TRANSIT AUTHORITY
(Inflated Dollars $ 000)

| | 1997 Actual | 1998 Budget | 1999 Estimate | 2000 Estimate | 2001 Estimate | 2002 Estimate | 2003 Estimate | 2004 Estimate | 2005 Estimate | 2006 Estimate | 2007 Estimate | 2008 Estimate | 2009 Estimate | 2010 Estimate | 2011 Estimate | 2012 Estimate | 2013 Estimate | 2014 Estimate | 2015 Estimate | 2016 Estimate | 2017 Estimate | Total 1997-2017 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***O&M COSTS*** | | | | | | | | | | | | | | | | | | | | | | |
| BUS OPERATION, MAINTENANCE, AND ADMINISTRATION | $65,123 | $67,666 | $78,484 | $82,518 | $87,334 | $92,433 | $97,830 | $103,544 | $109,593 | $115,998 | $122,779 | $129,958 | $137,558 | $145,606 | $154,126 | $163,148 | $172,700 | $182,814 | $193,524 | $204,864 | $216,872 | $2,724,473 |
| LRT OPERATION, MAINTENANCE, AND ADMINISTRATION | $0 | $0 | $0 | $9,023 | $9,861 | $18,211 | $19,443 | $20,318 | $21,976 | $22,965 | $24,458 | $25,558 | $26,706 | $27,910 | $29,166 | $30,478 | $31,850 | $33,283 | $34,781 | $36,346 | $37,982 | $460,317 |
| TOTAL | $65,123 | $67,666 | $78,484 | $91,542 | $97,195 | $110,643 | $117,273 | $123,862 | $131,569 | $138,962 | $147,236 | $155,516 | $164,266 | $173,516 | $183,292 | $193,626 | $204,550 | $216,098 | $228,305 | $241,210 | $254,854 | $3,184,791 |
| ***O&M REVENUES*** | | | | | | | | | | | | | | | | | | | | | | |
| PASSENGER AND SPECIAL SERVICE FARES (BUS) | $11,895 | $12,442 | $12,443 | $13,205 | $15,976 | $16,295 | $16,620 | $18,641 | $19,013 | $19,392 | $21,753 | $22,187 | $22,629 | $25,385 | $25,891 | $26,408 | $29,624 | $30,216 | $30,819 | $34,573 | $35,264 | $460,670 |
| PASSENGER FARES (LRT) | $0 | $0 | $0 | $2,707 | $3,451 | $6,098 | $6,476 | $6,767 | $7,369 | $7,701 | $8,162 | $8,530 | $8,913 | $9,315 | $9,734 | $10,172 | $10,629 | $11,106 | $11,606 | $12,130 | $12,676 | $153,546 |
| SALES TAX REVENUES | $53,024 | $56,550 | $60,056 | $64,020 | $136,234 | $145,089 | $151,618 | $158,441 | $165,571 | $173,022 | $180,807 | $188,944 | $197,446 | $206,331 | $215,616 | $225,319 | $235,458 | $246,054 | $257,126 | $268,697 | $280,789 | $3,666,213 |
| FEDERAL OPERATING FUNDS & PLANNING ASST. | $2,347 | $15,525 | $14,400 | $15,798 | $16,475 | $17,183 | $17,922 | $18,695 | $19,503 | $20,346 | $21,228 | $22,150 | $23,113 | $24,119 | $25,171 | $26,270 | $27,418 | $28,618 | $29,872 | $31,183 | $32,552 | $449,887 |
| INTEREST INCOME | $2,412 | $3,543 | $3,307 | $1,801 | $1,088 | $2,855 | $7,848 | $12,273 | $15,250 | $18,850 | $22,665 | $26,712 | $30,959 | $35,462 | $40,165 | $44,967 | $50,010 | $55,439 | $61,056 | $66,872 | $72,984 | $576,518 |
| DEBT SERVICE RESERVE FUND, INTEREST INCOME | | $359 | $349 | $313 | $294 | $172 | $110 | $110 | $110 | $110 | $110 | $110 | $110 | $110 | $110 | $110 | $110 | $110 | $110 | $110 | $110 | $3,143 |
| OTHER REVENUES | $1,428 | $1,284 | $1,323 | $1,290 | $1,320 | $1,351 | $1,382 | $1,415 | $1,448 | $1,483 | $1,518 | $1,555 | $1,592 | $1,631 | $1,671 | $1,712 | $1,754 | $1,796 | $1,843 | $1,889 | $1,937 | $32,625 |
| TOTAL | $71,107 | $89,702 | $91,878 | $99,133 | $174,839 | $189,042 | $201,977 | $216,343 | $228,265 | $240,904 | $256,244 | $270,186 | $284,764 | $302,353 | $318,359 | $334,958 | $355,005 | $373,343 | $392,434 | $415,454 | $436,312 | $5,342,601 |
| ***NET REVENUES FOR DEBT SERVICE AND CAPITAL*** | $5,983 | $22,037 | $13,383 | $7,591 | $77,644 | $78,399 | $84,704 | $92,481 | $96,696 | $101,942 | $109,008 | $114,671 | $120,497 | $128,837 | $135,066 | $141,331 | $150,455 | $157,245 | $164,129 | $174,244 | $181,458 | |
| ***AGGREGATE DEBT SERVICE COVERAGE RATIO*** | N/A | 6.57 | 2.66 | 1.97 | 17.84 | 18.01 | 19.47 | 32.44 | 46.07 | 48.55 | 51.83 | 54.64 | 57.33 | 61.31 | 64.38 | 67.25 | 71.57 | 74.88 | 81.68 | 86.70 | 86.77 | |
| ***CAPITAL COSTS*** | | | | | | | | | | | | | | | | | | | | | | |
| BUS & OTHER CAPITAL | $16,284 | $12,176 | $35,175 | $41,120 | $49,238 | $6,937 | $28,111 | $26,264 | $27,350 | $28,485 | $29,670 | $30,909 | $32,203 | $33,555 | $37,949 | $41,636 | $42,329 | $39,603 | $45,591 | $47,610 | $49,724 | $701,921 |
| LRT CAPITAL MAINTENANCE | | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $127 | $1,781 | $269 | $1,495 | $285 | $294 | $303 | $312 | $2,351 | $9,834 | $1,839 | $7,365 | $26,253 |
| N-S LRT PRELIMINARY ENGINEERING COSTS | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| N-S LRT CONSTRUCTION COSTS | $44,967 | $111,539 | $89,466 | $26,869 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $272,841 |
| BOND DEBT SERVICE | $0 | $3,353 | $5,027 | $3,858 | $4,353 | $4,352 | $4,350 | $2,851 | $2,099 | $2,100 | $2,103 | $2,099 | $2,102 | $2,102 | $2,098 | $2,102 | $2,102 | $2,100 | $2,009 | $2,010 | $2,091 | $55,260 |
| WEST-EAST LRT PE | | $5,900 | $2,500 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $8,400 |
| WEST-EAST LRT CONSTRUCTION | | | $23,550 | $164,850 | $188,400 | $94,200 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $471,000 |
| (New Capital Project Cost) | | | | | | | | | | | | | | | | | | | | | | $0 |
| REPAYMENT OF SUBORDINATED DEBT | $0 | $0 | $0 | $85,040 | $0 | $0 | $0 | $50,000 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $115,040 |
| TOTAL | $61,251 | $132,968 | $155,718 | $301,738 | $241,990 | $105,489 | $32,461 | $79,115 | $29,449 | $30,711 | $33,554 | $33,276 | $35,800 | $35,942 | $40,340 | $44,040 | $44,742 | $44,054 | $57,435 | $51,459 | $59,180 | $1,650,714 |
| ***CAPITAL REVENUES*** | | | | | | | | | | | | | | | | | | | | | | |
| NET REVENUES FOR DEBT SERVICE AND CAPITAL | $5,983 | $22,037 | $13,393 | $7,591 | $77,644 | $78,399 | $84,704 | $92,481 | $96,696 | $101,942 | $109,008 | $114,671 | $120,497 | $128,837 | $135,066 | $141,331 | $150,455 | $157,245 | $164,129 | $174,244 | $181,458 | $2,157,811 |
| FTA SECTION 5307 CAPITAL | $13,025 | $8,330 | $6,565 | $10,256 | $4,063 | $4,834 | $5,609 | $5,542 | $5,462 | $5,367 | $5,257 | $5,130 | $4,985 | $4,822 | $4,638 | $4,434 | $4,206 | $3,955 | $3,678 | $3,374 | $3,041 | $116,583 |
| FTA SECTION 5309 CAPITAL FOR BUS & OTHER | $1 | $30 | $9,595 | $14,314 | $30,636 | $250 | $14,675 | $5,796 | $5,970 | $6,149 | $6,334 | $6,524 | $6,720 | $6,921 | $7,129 | $7,343 | $7,563 | $7,790 | $8,024 | $8,264 | $8,512 | $168,539 |
| FTA SECT 5309 CAPITAL, LRT PE - N-S LRT | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| FTA SECT 5309 CAPITAL, N-S LRT CONSTRUCT | $37,248 | $68,451 | $68,351 | $34,653 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $208,702 |
| FTA SECT 5309 CAPITAL, W-E LRT PE | | $0 | $4,963 | | | | | | | | | | | | | | | | | | | $4,963 |
| FTA SECT 5309 CAPITAL, W-E LRT CONSTRUCT | | | $0 | $150,000 | $125,000 | $100,000 | $67,000 | $29,000 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $471,000 |
| FTA SECT 5309 RAIL MODERNIZATION | | | | | | | | | | | $1,425 | $215 | $1,196 | $228 | $235 | $242 | $249 | $1,881 | $7,868 | $1,471 | $5,892 | $20,901 |
| BOND LONG TERM | $27,740 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $27,740 |
| SUBORDINATED BONDS | $0 | $65,000 | | $50,000 | | | | | | | | | | | | | | | | | | $115,000 |
| FTA REIMBURSEMENT (FINANCING COSTS) N-S | $1,102 | $2,682 | $3,470 | $1,149 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $8,403 |
| FTA REIMBURSEMENT (FINANCING COSTS) W-E | | $0 | $0 | $1,500 | $2,250 | $2,250 | $2,250 | $750 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $9,000 |
| NET CAPITAL CONTRIB/USE OF RESERVES | $150 | $7,620 | $4,369 | $1,021 | $1,230 | $1,077 | $3,764 | $1,080 | $1,080 | $1,080 | $1,080 | $1,080 | $1,080 | $1,080 | $1,080 | $1,080 | $1,080 | $1,080 | $1,080 | $1,080 | $1,080 | $34,352 |
| BEGINNING CAPITAL RESERVE | $36,530 | $60,529 | $101,711 | $56,699 | $25,446 | $24,298 | $105,619 | $251,160 | $306,695 | $386,453 | $470,280 | $559,829 | $654,172 | $752,850 | $858,795 | $966,603 | $1,076,993 | $1,195,804 | $1,323,700 | $1,451,043 | $1,588,018 | $1,588,018 |
| TOTAL | $121,780 | $234,679 | $212,417 | $327,183 | $266,288 | $211,108 | $283,621 | $385,809 | $415,902 | $500,991 | $593,383 | $687,448 | $788,650 | $894,737 | $1,006,944 | $1,121,033 | $1,240,546 | $1,367,754 | $1,506,479 | $1,639,477 | $1,788,001 | $4,931,023 |
| ***Capital Reserve*** | $60,529 | $101,711 | $56,699 | $25,446 | $24,298 | $105,619 | $251,160 | $306,695 | $386,453 | $470,280 | $559,829 | $654,172 | $752,850 | $858,795 | $966,603 | $1,076,993 | $1,195,804 | $1,323,700 | $1,451,043 | $1,588,018 | $1,728,821 | |
| ***Less Debt Service Reserve*** | | -$8,653 | -$8,653 | -$5,503 | -$5,503 | -$5,503 | -$2,103 | -$2,103 | -$2,103 | -$2,103 | -$2,103 | -$2,103 | -$2,103 | -$2,103 | -$2,103 | -$2,103 | -$2,103 | -$2,103 | -$2,103 | -$2,103 | -$2,103 | |
| ***Less Operating Reserve*** | | -$7,000 | -$7,848 | -$9,154 | -$9,720 | -$11,064 | -$11,727 | -$12,386 | -$13,157 | -$13,896 | -$14,724 | -$15,552 | -$16,427 | -$17,352 | -$18,329 | -$19,363 | -$20,455 | -$21,610 | -$22,831 | -$24,121 | -$25,485 | |
| ***Less Risk Reserve*** | | -$4,823 | -$5,105 | -$5,404 | -$5,720 | -$6,055 | -$6,409 | -$6,784 | -$7,180 | -$7,601 | -$8,045 | -$8,516 | -$9,014 | -$9,541 | -$10,099 | -$10,690 | -$11,316 | -$11,978 | -$12,678 | -$13,420 | -$14,205 | |
| ***ENDING CAPITAL RESERVE*** | | $83,235 | $37,092 | $5,385 | $3,355 | $82,997 | $230,921 | $285,422 | $364,013 | $446,680 | $534,957 | $628,001 | $725,306 | $829,799 | $936,072 | $1,044,837 | $1,161,930 | $1,288,010 | $1,413,432 | $1,548,374 | $1,687,027 | |

- **If voter approval of an additional ¼ of 1 percent sales tax is deferred, UTA would have the financial capacity to construct and operate the West-East LRT line, while continuing to operate the North-South LRT line and operate existing bus services assuming: 1) $5 million in supplemental funding for the first five years of operation of the West-East line; 2) no increase in miles of bus service within the Salt Lake UZA until sales tax approval; and 3) containment of the rate of growth of O&M cost/mile at 3.75% per year until the sales tax increase is realized.**

  If voter approval of an additional ¼ of 1 percent sales tax did not occur in 2000, UTA would return to the voters in a subsequent year. For sensitivity testing purposes, an alternative financing plan was considered whereby voter approval was deferred until 2006. Under this scenario, an annual subsidy of $5 million would be required for the first five years of operation of the West-East LRT line over the 2002-2006 period. UTA is seeking the commitment of these funds from a variety of sources, including the State of Utah, City of Salt Lake, and other public and private sources.

# 6.5 PROJECTED ANNUAL DEBT SERVICE COVERAGE

Table 6.5-1 summarizes the results of the cash flow analysis with regard to UTA's ability to provide adequate annual debt service coverage on its outstanding bonded indebtedness over the 1997-2017 period. The table contrasts Net Revenues Available for Debt Service to UTA's aggregate debt service requirement, and indicates the level of debt service coverage such Net Revenues would provide.

Coverage of at least 1.25 times annual debt service costs is required by the bond resolutions for the Sales Tax and Transportation Revenue Bonds issued by UTA in 1997 and for the Subordinated Bonds UTA issued in 1998. The analysis assumes that in 1998 and 1999, UTA will pay interest costs on the Series 1998 Subordinated Bonds, in addition to debt service on the Series 1997 Bonds. The Series 1998 Bonds are expected to be paid down in full from FFGA receipts for the North-South LRT project by 2000. A new Subordinated Bond is expected to be issued in 2000, in anticipation of federal grant funding for the West-East Corridor LRT project. While these bond funds would be repaid in 2004 with federal grant receipts, UTA's debt service costs in 2000 through 2004 would include both the Series 1997 Bonds and the Subordinated Bonds to be issued in 2000. In years 2004 and beyond, UTA's debt service payments would cover its outstanding Series 1997 Bonds, which would remain in effect through 2023.

## 6.5.1 Key Findings

- **Throughout the 1997-2017 period, UTA will have sufficient annual Net Revenues for payment of debt service on its outstanding bonds.**

  As shown in Table 6.5-1, UTA is expected to have sufficient annual Net Revenues for Payment of Debt Service and Capital Costs to provide debt service coverage through 2017. UTA's annual debt service coverage is projected to range from a low annual level of 1.97x in 2000 to a high annual level of 86.77x in 2017. The main reason UTA is able to provide adequate debt service coverage is that its revenue from Sales Tax is unrestricted with regard to use, and these funds are applied first toward O&M and then toward debt service.

**Figure 6.4-1**
**Net Capital Revenues vs. Expenditures**

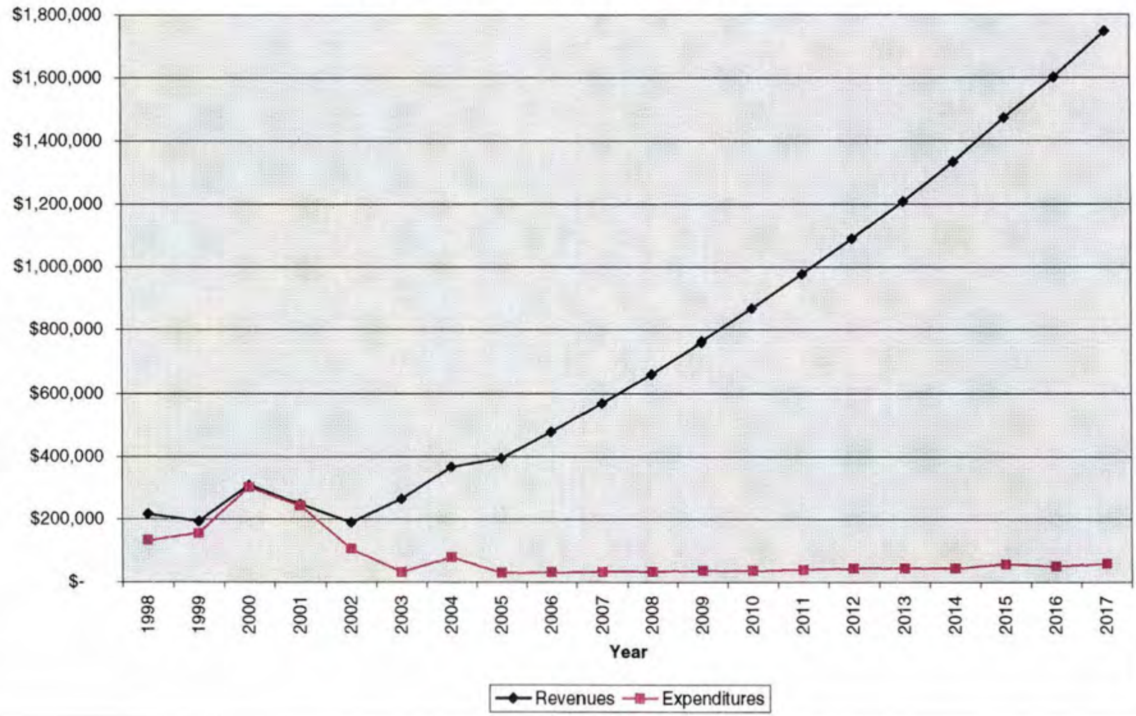


**Table 6.5-1**
**Annual Debt Service Coverage: 1997 - 2017**
**(Inflated Dollars $000)**

| | Net Revenues for Debt Service and Capital | Aggregate Debt Service Requirement | Aggregate Debt Service Coverage Ratio |
|---|---|---|---|
| 1997 | $ 5,983 | $ - | NA |
| 1998 | $ 22,037 | $ 3,353 | 6.57 |
| 1999 | $ 13,393 | $ 5,027 | 2.66 |
| 2000 | $ 7,591 | $ 3,858 | 1.97 |
| 2001 | $ 77,644 | $ 4,353 | 17.84 |
| 2002 | $ 78,399 | $ 4,352 | 18.01 |
| 2003 | $ 84,704 | $ 4,350 | 19.47 |
| 2004 | $ 92,481 | $ 2,851 | 32.44 |
| 2005 | $ 96,696 | $ 2,099 | 46.07 |
| 2006 | $ 101,942 | $ 2,100 | 48.55 |
| 2007 | $ 109,008 | $ 2,103 | 51.83 |
| 2008 | $ 114,671 | $ 2,099 | 54.64 |
| 2009 | $ 120,497 | $ 2,102 | 57.33 |
| 2010 | $ 128,837 | $ 2,102 | 61.31 |
| 2011 | $ 135,066 | $ 2,098 | 64.38 |
| 2012 | $ 141,331 | $ 2,102 | 67.25 |
| 2013 | $ 150,455 | $ 2,102 | 71.57 |
| 2014 | $ 157,245 | $ 2,100 | 74.88 |
| 2015 | $ 164,129 | $ 2,009 | 81.68 |
| 2016 | $ 174,244 | $ 2,010 | 86.70 |
| 2017 | $ 181,458 | $ 2,091 | 86.77 |

- **UTA's Net Revenues will leave significant funds available for new capital projects, after payment of debt service requirements.**

  With the ¼ of 1 percent increase in the sales tax, the Authority's Net Revenues Available for Debt Service and Capital will continue to increase throughout the 1997-2017 period. This will enable to Authority to expand bus and LRT services, and to implement new projects throughout the region.

## 6.6 PROJECTED CAPITAL RESERVE

Two additional factors of interest in this analysis are: 1) the level and pattern of build-up of the Authority's annual Capital Reserve for major capital costs beyond those described and projected herein; and 2) the relative adequacy of UTA's annual Capital Reserve relative to its Restricted Reserve requirements.

Figure 6.6-1 charts UTA's annual Capital Reserve over the 1997-2017 period, both alone and in relation to its policy-driven requirements with regard to Restricted Reserves. With the infusion of funds from the additional sales tax, UTA's Capital Reserve is expected to grow through the balance of the period.

### 6.6.1 Key Findings

- With the addition of the increased sales tax revenue beginning in 2001, UTA's annual Capital Reserve will build over the 2001-2017 period. In the absence of new major capital projects, the Capital Reserve will grow to roughly $1.728 billion by 2017

- Although the level of UTA's Restricted Reserve accounts will increase over the 1997-2017 period, the Authority will be capable of meeting and greatly exceeding the reserve levels.

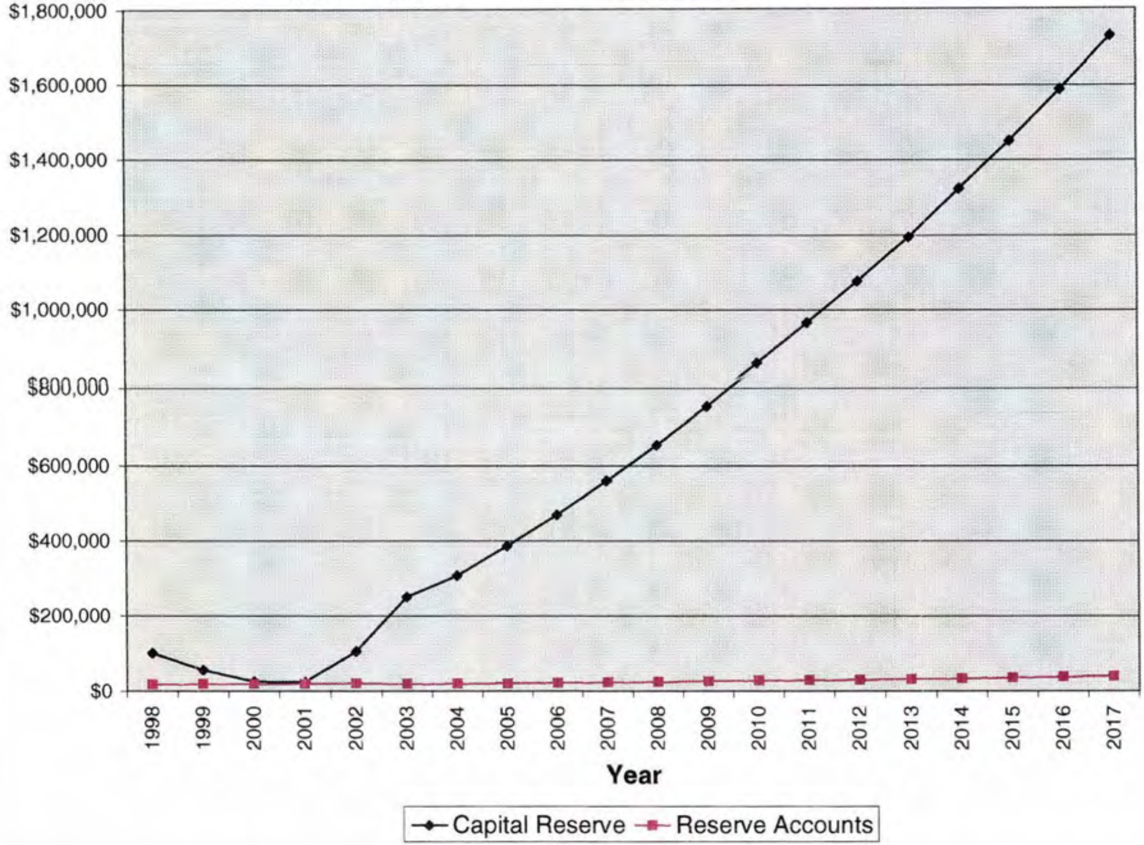
- With its large and growing Capital Reserves, the Authority will be well positioned to provide a higher level of community, corridor, and region-wide transit services. These services would include future bus and rail system expansion and implementation of major transit capital investments recommended in the long range transportation plans for the region.

## 6.7 CAPITAL COST ESTIMATE

The capital cost for the West-East LRT line was developed through an extensive cost estimating process conducted during the Preliminary Engineering stage of the project. Table 6.7-1 provides is a general breakdown of the capital cost of the West-East LRT line in Year of Expenditure dollars, escalated to the year of construction. This value is a compilation of construction costs and non-construction costs.

The construction costs have been detailed to a level where unit costs have been developed and provided for the various line items utilized in the project. For instance, the unit cost of curb and gutter has been developed from past projects or construction estimating manuals and multiplied by the quantity of curb and gutter quantified in the Preliminary Engineering drawings.

Figure 6.6-1
Projected Capital Reserves & UTA Required Reserve Accounts



Non-construction costs used in the capital cost estimate were developed using standard industry practice for projects of this complexity. These costs include Project Management, Project Administration, Design, Construction Management, Quality Assurance, Quality Control, Business Impact Mitigation, Property Appraisal and Relocation, Contractor Allowances, Insurance, Start-up and Testing, Project Reserve, and Financing.

**Table 6.7-1**
**West-East LRT Line Project Budget**
**(Year of Expenditure Dollars, 000)**

| MAJOR TASK AREA | COST |
|---|---|
| Project Management and Administration | \$23,800 |
| Real Estate | \$8,300 |
| Final Design/Construction | \$319,900 |
| Procurement | \$73,000 |
| Start-up and Testing | \$3,200 |
| Contingency Reserve | \$42,800 |
| **TOTAL, CONSTRUCTION** | **\$471,000** |
| Financing | \$9,000 |
| **TOTAL PROJECT COST** | **\$480,000** |

# SECTION 7
# PUBLIC INVOLVEMENT AND AGENCY COORDINATION

This section presents the response to DEIS comments and agency letters, and a summary of FEIS public involvement activities and regulatory agency coordination.

## 7.1 INTRODUCTION TO DEIS RESPONSES TO COMMENTS

The Major Investment Study/Draft Environmental Impact Statement (MIS/DEIS) for the University-Downtown-Airport West-East Corridor was made available to the public on August 1, 1997. According to federal regulations, the availability of the MIS/DEIS and the 45-day comment period was announced by the U.S. Environmental Protection Agency in the August 1, 1997 Federal Register. The document's availability, the comment period, and the August 18, 1997 public hearing were also announced through public notices in the local newspapers on August 1st, 2nd, and 10th. In addition, the Deseret News and Salt Lake Tribune ran stories on August 1st, and have run several follow-up articles in subsequent issues.

Copies of the MIS/DEIS were circulated to all interested parties and agencies, and some 150 members of the public who had expressed interest in the project received post cards announcing the public meeting and the availability of the document. Copies of the document were made available to the public at all Salt Lake City public libraries, and at the Law, Marriott, and Health Sciences libraries at the University of Utah. Librarians at Salt Lake City's downtown branch indicated that the public made significant use of the copies provided at that location. Copies were also provided to individuals and organizations who requested them. Public comments on the DEIS were accepted from August 1st through the end of business on September 15th, and members of the public were instructed to submit those comments to the Wasatch Front Regional Council (WFRC). WFRC also hosted an informational open house and public hearing on August 18th to provide detailed information about the project and solicit public comments.

Twenty-eight people attended the August 18th public hearing, which was held at the downtown branch of the Salt Lake City Public Library. Approximately 20 agency representatives and consultants were on hand at the open house to provide detailed information and accept comments on the DEIS.

**Content of Comments**
During the 45-day comment period, WFRC received a total of 88 comments from 34 individuals and entities. Forty-six of these comments were submitted at the August 18th public hearing, 28 of them in writing, and another 18 were given orally to members of the study team and representatives of sponsoring agencies. Outside of the meeting, WFRC received 42 comments from 11 interested parties. Of the total 88 comments, 34 strongly favor the preferred alternative, Alternative C- Light Rail Transit. Fifteen of the comments firmly opposed this alternative, and the remaining 39 comments expressed specific concerns with alignments, aesthetics, cost, schedules, station locations, and provided specific suggestions or corrections for the document. Some of these comments carry the implication that the author would approve of the preferred alternative if his or her concerns were addressed, while others simply state that a particular aspect of the alternative as proposed is objectionable.

Those who favored the LRT alternative give a variety of reasons for their support. Commonly cited bases include improvements in air quality, preservation of open space by reducing the need for additional roadways, improved commute times, and the ability for commuters to use their travel time productively on a LRT system. Others cited the traffic congestion currently experienced on major roadways, and the resulting spill-over of traffic into neighborhoods. They favored LRT because they feel it will ease overall traffic congestion and reduce the tendency of commuter traffic to travel through residential areas. Several supporters also noted limited parking facilities at the University of Utah and downtown Salt Lake City. Several who favored LRT cautioned that the system must allow users to transport bicycles on the LRT vehicles, and must provide service frequently enough that riders do not need to be familiar with the operating schedule.

Of those who opposed the LRT alternative, many cited cost and interference with vehicle traffic as major concerns. Some residents were concerned that because there is no funding currently available for an West-East LRT line, construction and operation will require a tax increase, which they strongly oppose. Others noted that for virtually all of the West-East line's alignment, the LRT vehicles must mix with vehicular traffic, which will simply aggravate the traffic congestion already present on city streets. In particular, left turns will be made difficult or impossible by an alignment of the LRT tracks down the center of the street. Some residents also worried that this system is being advocated purely for the Olympics, and feel it is far too expensive to build if the Winter Games are the primary justification for the project. Several residents felt that buses can accomplish the same objective at a greatly reduced cost.

Finally, 39 public comments neither favored nor opposed the LRT alternative explicitly, but cited specific concerns with one or more aspects of the LRT alternative. Examples of these concerns included:

- Don't like the alignment along 400 South, because it will already have heavy traffic from the new I-15 off-ramp, and because 100 South, 200 South, or 300 South would provide better service to the South Temple area and Bryant Intermediate School;
- Costs of building the system are unknown, and because ridership is also unknown, it is impossible to predict how much of the operation and maintenance costs can be covered from farebox revenues;
- Numerous factors suggest that ridership to University Hospital would be much greater than to Research Park, yet the modeling shows little change in ridership with the proposed terminus change;
- Do not implement the LRT spurs without public support. See how the North-South TRAX operates and justifies the expense before engineering the spurs;
- Very important that commuters with bicycle be able to ride the LRT system.

The following section (Section 7.1.1) presents the responses to both oral and written comments taken during the public hearing for the MIS/DEIS.

### 7.1.1 Responses to Oral and Written Comments

**John Fanning and Hannah Fanning**

Comment: I and my wife strongly favor east-west LRT and taxes needed to build and operate it.

Response: The MIS/DEIS for the Airport to University West-East LRT Corridor Study selected the LRT alternative as the locally preferred alternative. As part of the additional technical analysis for the Final Environmental Impact Statement (FEIS), the financial analysis and funding scenarios are being reevaluated, updated and revised. Utah Transit Authority (UTA) is required to provide a recommended funding scenario in the FEIS for the long-term operational and maintenance of the West-East LRT system. The financial information for the West-East LRT system is contained in Section 6 of the FEIS and include the following statement:

The ongoing operating and maintenance costs of the UTA base system and the West-East Corridor project can be financed from existing revenue sources supplemented by an increase in UTA's existing 1/4 percent sales tax. An additional ¼ percent sales tax is proposed for voter approval in 2000, with revenue collection to begin in 2001 throughout the 1997-2017 period.

As an alternative to this proposed Financing Plan for the West-East LRT line, an alternative scenario was evaluated whereby voter approval of an additional ¼ of 1 percent Sales Tax was deferred for seven years until 2006. This scenario assumed the commitment of $5 million in operating support from a combination of State, local, and private sources for the first five years of operation of the West-East line over the 2002-2006 period, followed by voter approval of a sales tax measure in 2006.

**Nick J. DeLuca, Jr.**

Comment: I support LRT because it saves time for commuters, allows them to accomplish something during the commute, and has positive impacts on air quality.

Response: Concur. The FEIS states that the LRT alternative is the proposed action for the West-East Corridor. The LRT alternative provides a multi-modal transportation system that, among other objectives, provides travel time savings to commuters and will generally improve air quality in most locations in the West-East Corridor. WFRC analysis as noted in Section 4 indicates travel times to the airport, University and downtown will be reduced for LRT commuters throughout the valley.

**Cheri Carlson, Sugarhouse Community Council**

Comment: Why isn't the U of U included in the participating organizations? I oppose street widening for the implementation of LRT. Reconstruction of landscaping buffers and improved sidewalks would add to the expense. Existing land uses would be compromised, forcing a proximity to the rail corridor. Relook at the location of the station for the southwest of the U of U campus, it might be better for a site specific place nearer the stadium. Pioneer Park must not be encroached upon. Use the historic Union Pacific and Rio Grande Stations as rail stations. Keep a sense of continuity and respect for our public buildings. Do not implement the spur without public support. See how the north-south TRAX operates and justifies the expense before engineering the spurs. Incorporate bicycle facilities with the rail whenever possible.

Response: During the FEIS phase of the West-East Corridor Study, several working groups were formed to discuss issues and concerns regarding the potential impacts and the design of the LRT system. The University of Utah, and its surrounding neighborhoods have been an active part of one of those working groups. In addition, the West-East FEIS study team has been actively meeting with U of U facilities planners and engineers to coordinate efforts occurring for the West-East LRT and the University's Long Range Plan Update. Morever, study team representatives have been attending the U of U's monthly Open Forum meeting to keep university officials and the public update on the progress of the study.

To accommodate the LRT system and auto traffic, streets such as 400 South, South Campus Drive, Wasatch Boulevard and Medical Drive would need to be widened. Construction impacts, such as the removal of existing curb and gutter, landscaping, and trees would occur. As mitigation for these impacts, new curb and gutter, landscaping, street trees, and in some cases new sidewalks would be constructed to maintain the same pedestrian access and urban design elements as exist today. While these street reconstruction measures would add to the construction cost, it is not anticipated that existing land uses would be compromised with regard to access changes, land use changes, or pedestrian/auto conflicts with the LRT system. Coordination with U of U planning and engineering staff, the LRT station locations have been reevaluated and revised based upon university input, public and agency input, to more effectively integrate with the existing and planned activities, events and transportation needs of the university campus.

Pioneer Park will not be affected by the construction of the West-East LRT system. An LRT station is planned near the Union Pacific Station and within 11/2 blocks of the Rio Grande Station. In a separate study, an Intermodal Facility for all rail lines is planned at 600 West and 200 South. In the future, a downtown circulator may be integrated into the North-South and West-East LRT lines to connect the LRT systems to the Intermodal Facility once it is constructed.

The West-East LRT line is not an extension of the North-South LRT line, but a separately functioning electric transit service that will serve riders to and from the airport, Salt Lake City downtown, and the University of Utah. The West-East LRT line is a vital link in the core LRT system for the Salt Lake City area.

As part of the planning for the West-East FEIS, bicycle facilities are being incorporated whenever possible along the LRT line. See Section 4 for specific details.

**Larry Lewis, Utah Department of Agriculture and Food**

Comment: The Utah Department of Agriculture and Food supports the concept of an east-west commuter rail line servicing the downtown Salt Lake City area and points west. We have two issues to address: Several hundred state and private employees at the

UDAF complex near Redwood Road and North Temple need a connection to the north-south bus service ending in the downtown area. The promotion of mass public transit is favorable for Utah agriculture in general as it will eventually lessen the need to build more freeway lanes and highways, which contribute to damaging urban sprawl. Mass transit promotes farmland, clean water, reduced air pollution and open space preservation.

Response: Comment noted regarding support of the West-East LRT (not commuter rail) line. A West-East LRT station is planned just east of Redwood Road to serve the state employees in this area. The West-East LRT line will interface with UTA bus transit service at certain downtown LRT station locations. The West-East LRT line will be comparable to bus transit lines and bus-LRT transfers will be available to transit riders. UTA has developed recommended funding scenario for the operation and maintenance of the West-East Light Rail Project. See Section 6 of this FEIS document for detailed information on funding aspects of the project. The construction of LRT systems generally contribute to a redevelopment of land uses along the LRT line especially in downtown Salt Lake City. Transit lines generally do not contribute to urban sprawl and can promote intensification of land use along the corridor, preserving open space and farmland. Comments noted regarding the protection of farmland, clean water, clean air and preservation of open space.

**Edie Trimmer and Gordon Stores, Poplar Grove Community Council**

Comment: Our community council supports the transition from single occupancy vehicle travel to more diverse transportation modes, including mass transit. We hope that the North-South and West-East projects are not mutually exclusive and that financial resources can be allocated appropriately so the east-west and north-south traffic concerns are addressed. We support the LRT option for the West-East corridor for the following reasons: It defines our neighborhood boundaries and could further the development of positive neighborhood identities. It has the potential, despite the low increases in transit ridership initially, to reduce VMT traveled in the west-east study corridor. It creates opportunities for increasing access by all modes from our neighborhood to other parts of the city as part of planning and construction (trails, access, mass transit, etc.). It creates opportunities for redevelopment of North Temple industrial and commercial zone. We hope the visibility of the system promotes change in lifestyles and transportation modes used. Our concerns are safety issues with traffic, bikes, and LRT. We are concerned about the loss of traffic lanes, which could push traffic onto neighborhood streets if it does not significantly reduce vehicles. We are concerned about loss of bike lanes. The high cost is a concern especially if the money is diverted from other important public uses. Where will the money come from? We hope that these investments in LRT will not be at the expense of good mass transit in our neighborhood to downtown and west to the expanding industrial areas.

Response: Concur. Comments noted. The LRT alternative is the proposed action for the West-East Corridor because it will improve transit reliability, is compatible with other transportation modes, interfaces with the regional transportation system, and provides a multi-modal transportation system that is convenient and accessible to people with a wide variety of needs. With regard to safety concerns between auto traffic, bicycles and LRT, the LRT system will have its own dedicated right-of-way separated from auto traffic, pedestrians and bicyclists by barrier medians. In addition, signalized and timed intersections with left turn lanes and crosswalks will be part of the LRT design that will provide safety and eliminate conflicts between auto traffic, bicyclists and LRT. The number of travel lanes on North Temple, 400 West and 400 South will be maintained. Some loss of on-street parking will occur. Bike lanes will be incorporated into the design as much as possible. UTA has developed the recommended funding scenario for the operation and maintenance of the West-East LRT system. See Section 6 of this FEIS document for detailed information on funding aspects of the project. UTA takes a system approach to developing and implementing transit (LRT and bus) service throughout the Salt Lake City area.

**Allen McCandless, SLCIA**

Comment: We support the West-East LRT option to the airport, and have accommodated it in our master plan. Important to keep in mind that the airport funds may only be used for airport facilities. Add new runway to figures 3-1, 3-2, 3-3, 3-5, 3-7 and specific corrections in document.

Response: Noted. The airport planning staff, engineers, and master plan architect comprise one of the West-East Light Rail FEIS working groups. Close coordination with airport planning staff has been ongoing throughout the FEIS process. The new runway has been added to the FEIS figures.

**Walt Steinvorth, UDOT Urban Planning**

Comment: Numerous factors suggest that ridership to University Hospital would be much greater than to Research Park, yet the modeling shows little change in ridership with the proposed terminus change. Suggest you re-examine the modeling, with special attention to special generators.

Response: As part of the additional technical analysis for the FEIS alignment extensions to the Research Park were analyzed. The results of that analysis show commuters to the Research Park are better served by bus shuttle service. The Research Park, Hogle Zoo, Red Butte Arboretum, and This is the Place State Park are all considered special generators for ridership in the eastern portion of the corridor.

**Joseph Horton, Primary Children's Medical Center**

Comment: Primary Children's supports preferred alternative C as it has 94,000 visits per year and 2,100 employees who would use LRT. Primary Children's treats many children for conditions that are aggravated by air pollution. We support any solution that improves air quality while enhancing transportation system. On-site parking and traffic is real challenge at Primary Children's. Quiet, unobtrusive LRT is a viable way to meet increase demand for services without negatively impacting surrounding neighborhoods.

Response: Concur. Comments noted. The LRT alternative is the proposed action for the West-East Corridor Study because it is convenient and accessible to people with a wide variety of needs, will improve transit reliability between major corridor distraction, will generally improve air quality, and will provide environmental, community, and aesthetic compatibility with the surrounding area.

**Mayor and City Council, Salt Lake City Corporation**

Comments: We are highly supportive of the West-East line. It is the natural next step to link the three largest traffic generators. The importance of West-East line will become apparent as the integrated transit system is developed, with commuter rail, more buses, and LRT spurs to West Valley City, West Jordan, Draper, and Sandy. East-West LRT has great potential to reduce traffic through the neighborhoods. Current and planned highway expansions have the potential to severely impact neighborhoods. We do not want neighborhood streets turned into major arterials. Consider extending eastern terminus through Research Park to the Hogle Zoo/This is the Place State Park area. Use 300 South instead of 400 South through downtown. 400 South will already see increase traffic from the new I-15 off-ramp, and cannot handle LRT as well. Use Rio Grande Street instead of 400 West. Extend the western terminus to the International Center.

Response: Comments noted. The West-East LRT system will be a vital link in an area-wide multi-modal transportation system that is compatible with the transportation projects in the area, including the North-South LRT line, and the potential commuter rail corridor. As part of the additional technical analysis for the FEIS, several LRT alignment options (including 300 South and Rio Grande Street) and LRT extensions (including the Research Park and the International Center) were evaluated. The results of that evaluation show that the 400 West and 400 South alignment through downtown Salt Lake City is the best LRT alignment. Also, the study showed that the Research Park would be better served via bus shuttle service and that the projected ridership to the International Center does not justify an LRT extension at this time. See Appendix B for study details.

**Michael T. Packard**

Comment: LRT is an archaic, obsolete mode of transportation that doesn't work any better now than trains did 100 years ago. We should take the initiative and build a system that will actually be useful. CyberTram is lightweight, low cost, fast, can be built quickly, and is elevated for safety.

Response: As part of the Major Investment Study/Draft Environmental Impact Statement (MIS/DEIS) for the Airport to University West-East Corridor, many transportation modes and technologies were considered during 1996 and 1997. Bus transit systems and fixed gateway systems, such as light rail transit, monorail, and cybertrain were among the modes and technologies considered. Light Rail Transit (LRT) was determined to be the locally preferred alternative for transit since it is a reliable, efficient mode of transportation that interfaces well with Salt Lake City's other modes. Cybertrain is a people mover technology that does not have the passenger capacity that Light Rail Transit does. This technology was not considered as one of the alternatives in the MIS/DEIS because it is not well suited for the Salt Lake City area. In addition, many major metropolitan areas such as San Diego, San Jose, Portland and Denver have constructed LRT systems that have proven to be effective modes of travel for many riders.

**Mrs. John Morton**

Comment: We're really tired of having LRT crammed down our throats.

Response: Comment noted. As part of the Major Investment Study/Draft Environmental Impact Statement (MIS/DEIS) process for the West-East Corridor, numerous transportation modes, technologies and strategies were developed and discussed, including Light Rail Transit (LRT). In addition, the MIS/DEIS evaluated three alternatives in detail, including the No-build, Bus/HOV, and LRT alternatives. Additional analysis on alternatives and alignment options and extensions was accomplished as part of the studies for the FEIS (see Appendix A and B). Throughout the MIS/DEIS process there has been extensive public and stakeholder involvement, and agency coordination regarding all transportation alternatives.

**Daren Rasmussen**

Comment: I support LRT and I would rather see it funded through sales tax than property tax.

Response: Concur. With regard to LRT funding, UTA has developed a recommended funding scenario for the operation and maintenance of the West-East LRT system. See Section 6 of this FEIS document for detailed information on funding aspects of the project.

**Leon Butterfeild**

Comment: LRT, the Olympics, and I-15 are not going to benefit the people of Utah. We are being taxed out of our homes.

Response: Comment noted. Light Rail Transit (LRT) is the locally preferred alternative for the West-East Corridor. LRT is part of a multimodal regional transportation system that includes the I-15 HOV/lane improvements, the North-South LRT, bus transit enhancements and other transportation improvements. These ongoing transportation improvements are all a part of a regional solution to Salt Lake City's transportation needs.

UTA has developed the recommended funding scenario for the West-East LRT alternative. See Section 6 for more detailed information on funding for the project.

**Jan Tobias**

Comment: Against the West-East LRT. Against any tax increases. Think people should be able to vote on LRT. Think buses can do the job. LRT is 19th century technology.

Response: Comments noted. The MIS/DEIS and FEIS process is a public process that incorporates public opinion and input throughout its duration. This public and stakeholder involvement is an important part of the decision-making process for the West-East Corridor Study. It includes various methods (such as comment sheets, open houses, DEIS review and comment, and direct line contact to project planners) to gather public opinion.

Section 6 of the FEIS includes detailed information on the recommended funding scenario for the operation and maintenance of the West-East LRT line. In addition, Section 2 and Appendix A presents detailed information on the Bus/HOV alternative and the busway alternatives that were analyzed as part of the West-East Corridor Study. The MIS/DEIS also analyzed the Bus/HOV alternative and concluded that the LRT alternative is the locally preferred alternative. The LRT alternative is the proposed action for the West-East Corridor Study because it provides a reliable, efficient transportation mode to meet Salt Lake City's needs.

**Rawlins Young**

Comment: Have concerns about the environmental justice conclusions. Suggest that more information about regional numbers of minorities and low-income families in comparison to corridor numbers. Would like the study to address impacts over time to areas along I-15 and with UTA. LRT is spending too much for a high cost system when money could be spent for other services to serve disadvantaged groups.

Response: Environmental justice is one of the issues addressed in the MIS/DEIS and the FEIS for the West-East Corridor. It is the conclusion of this analysis that no disproportionate adverse effect is caused by the proposed project for minorities and low-income families. The West-East LRT system would follow 400 West and 400 South where minority and low-income population are more prominent in the corridor (the Gateway area and the east central area of downtown). Bus routes will also be rerouted to better serve these areas and interface with the LRT line. In most cases, as part of the EIS analysis, potential impacts are evaluated in terms of a future year, either the year of construction or a future planning year. Construction funding for the West-East LRT line is 100 percent funded through federal sources. UTA has developed the recommended funding scenario outlined in Section 6 of this FEIS document.

LRT offers the promise of greater mobility for disadvantaged groups, which often have reduced options for mobility because of the high cost of owning and operating automobiles. Transit-dependent persons will have increased flexibility to travel for employment, shopping, and other purposes.

**General Verbal Comment**

Comment: East-west corridor will help distribute LRT riders from the North-South spine.

Response: Concur. The West-East LRT system will provide two transfer locations to the North-South line that will help distribute riders from that line to the West-East LRT line. These locations are 400 West/South Temple and 400 South/Main Street.

**General Verbal Comment**

Comment: Monorail should be considered for the West-East.

Response: During the MIS/DEIS phase of the West-East Corridor Study, many modes and technologies were discussed and evaluated. As part of the screening of alternatives, a monorail system was dropped from further evaluation and the LRT alternative was advanced as the locally preferred alternative. Detailed information on this screening process is included in the MIS/DEIS and is summarized in Section 2 of the FEIS.

**General Verbal Comment**

Comment: Connection to the airport will make travel to the airport much more convenient from the points south of Salt Lake City.

Response: Concur. Riders on the North-South line will be able to travel from points south of downtown Salt Lake City, such as Sandy or Draper, and transfer to the West-East line at 400 South/Main Street. From this location on the West-East line, passengers can ride all the way to the western terminus of the West-East line which will end in the proposed Transportation Center of the SLCIA.

**General Verbal Comment**

Comment: East-West LRT should be located as close to Rice Stadium as possible to minimize walking distance from the stadium station.

Response: On the eastern end of the West-East Corridor, the West-East LRT will turn north off of 500 South, run along the alley of University Avenue and the west side of the Rice-Eccles Stadium parking lot, then turn east onto 400 South, then onto South Campus Drive of the University of Utah. An LRT station is planned at Rice Stadium and the Fieldhouse, and another LRT station is planned at South Campus Drive and Central Campus Drive, about one block east of the east side of Rice Stadium. This design will provide excellent access to the stadium and other university venues for campus and other special events.

**Roly Pearson**

Comment: More LRT, the sooner the better. Very important that commuters with bicycles be able to ride the LRT system. Very important that LRT is run to provide maximum service in first two years. Only way to get people riding the system is to run trains frequently enough that riders do not need a schedule.

Response: Comments noted. Provisions are being made as part of the preliminary design to accommodate bicyclists for the West-East LRT system. Also, as part of the FEIS studies, an analysis was completed incorporating bike paths into the overall LRT system as much as possible (see Section 4). An West-East LRT operation plan is being developed as part of preliminary design. This operation plan will specify the type of level of service (frequency) for the LRT trains. It is anticipated that 10 minutes headway would be the LRT service needed during peak hour demand each day during the work week.

**Jay Dalby**

Comment: Why are people petitioning against LRT when already being built? Why are peope against LRT? I am concerned that the government keeps cutting funding of things when the price of the bus fare keeps going up. Are more spurs planned for the future, or just the two lines?

Response: Comments noted. Construction of the Airport to University West-East LRT system will receive 100 percent funding from federal sources. The LRT fare will be the same as the bus transit during the first year of operation. UTA has developed the recommended funding scenario for the operation and maintenance of the West-

East LRT system. Major Investment Studies are underway to evaluate other spur lines to link with the North-South LRT lines such as in the area of Sandy and Draper. The West-East LRT and North-South LRT lines are the foundation of a planned regional transportation system to meet area residents' mobility needs.

**David "Ashby" Giroux**

Comment: East-west line should run up 100, 200, or 300 South to serve downtown, South Temple and Bryant Intermediate School, Montview, U of U and President's Circle. These routes would not add to congestion on 400 South and 500 South and would avoid passing an elementary school.

Response: A detailed evaluation of West-East LRT alignment option and extensions was completed as part of the FEIS studies. The results of those detailed studies show that the preferred alignment is on 400 West and 400 South in downtown. See Section 2 and Appendix B for details and comparisons of this study.

**Deanna Kennedy**

Comment: I prefer rail over bus because rail tracks provide assurance that train will come eventually. No such assurance is provided with bus. Salt Lake City is similar to St. Louis LRT with stops on both sides of campus, and people can carry bikes on train. LRT is worth any cost.

Response: Comments noted. The LRT alternative is the proposed action for the West-East Corridor because it is convenient and accessible to people with a wide variety of needs and will improve the reliability of transit between major destinations in the corridor. We agree that Salt Lake City is similar to St. Louis Metrolink (LRT transit) line in that there are many special generators within their respective transit corridors. Four LRT stations are planned for the U of U campus with the eastern terminus of the West-East LRT line being at the Health Sciences Center. Provision for bicycle access to the West-East LRT line is being incorporated into the preliminary design of the system.

**Hanna C. Fanning**

Comment: I favor East-West LRT and am willing to support the necessary taxes.

Response: Concur. With regard to tax increase, UTA has developed the recommended funding scenario for the operations and maintenance of the West-East LRT line. See Section 6 for more detailed information on funding for the project.

**General Verbal Comment**

Comment: How will the schedule of the West-East line mesh with the North-South schedule?

Response: There will be two LRT transfer locations for the West-East LRT line and the North-South LRT line: 400 West/South Temple; and 400 South/Main Street. During peak hour LRT operations, 10-minute headways are anticipated for both the North-South and West-East lines. Riders will be able to get off the North-South LRT line at 400 South/Main Street for example, walk to the nearby West-East LRT station, then have less than a 10-minute wait for the next West-East LRT train.

It is expected that efforts will be made to synchronize the arrivals of trains where possible, and the timing of trains will be reevaluated after both lines are in operation. Headways will likely be changed to meet demand for specific special events.

**General Verbal Comment**

Comment: Like the idea of LRT extension to the State Park and Zoo. Menlove RV Park on North Temple concerned about left turn in and out of RV Park with LRT in place. Wants to be contacted in future to participate in design process.

Response: A detailed evaluation was conducted of possible LRT alignment options and extensions as part of the FEIS studies. An LRT extension to the east, to Research Park and Hogle Zoo was evaluated. The results of that evaluation shows that this area would be better served by a bus shuttle rather than a LRT extension (see Section 2 and Appendix B for evaluation details). Mr. Menlove has been an active participant on the North Temple working group. Additional meetings have also been held between members of the West-East LRT FEIS and design study team and Mr. Menlove to address his concerns about access to his RV park.

**General Verbal Comment**

Comment: Concern about impact on environment if LRT line is extended to Fort Douglas and Red Butte Creek.

Response: A detailed evaluation was conducted of a possible eastern alignment extension to Research Park and Hogle Zoo. This alignment extension would cross a portion of Fort Douglas and Red Butte Creek. Many engineering and environmental criteria were used in the evaluation of LRT extensions to the east. Potential impacts to Fort Douglas, a National Register of Historic Places site, and Red Butte Creek were two of the environmental considerations. The evaluation results showed that the area around Research Park could be better served by a bus shuttle on existing roadways and streets than a LRT extension. Therefore, an eastern LRT extension is not a part of this project. (See Section 2 and Appendix B for more evaluation details.)

**General Verbal Comment**

Comment: Questions about traffic and pedestrian issues on 400 South; wants expansion of where stations would be located; also, there appears there would be a problem with left turns at intersections. Supports LRT and likes overall concept.

Response: A detailed traffic analysis was conducted on 400 South as part of the FEIS studies (see 400 South Traffic Analysis Report). It is anticipated that 400 South will be able to accommodate projected traffic volumes and LRT. LRT stations will be located along 400 South at 200 West (future), Main Street, 200 East, 600 East, and 800 East. Left turn lanes with signalized intersections are being incorporated into the West-East LRT design. Therefore, left turns will be well accommodated along 400 South in the downtown area as LRT will run along the sides of the street rather than in the median as proposed elsewhere in the corridor.

**General Verbal Comment**

Comment: The corridor will intersect a hiking/biking trail on North Temple when LRT is constructed. I am concerned about power wires on North Temple, would prefer public park rather than LRT parking at State Fairpark LRT station.

Response: Access to pedestrian and bicycle trails have been incorporated into the design of the West-East LRT system whenever possible. Due to the necessity for having three auto travel lanes in each direction, LRT system ROW, and left-turn auto lanes at intersections, there is not enough ROW on North Temple for additional bicycle lanes. The State Fairpark owns the vacant property to the south of the Fairpark. They are in the process of developing a site plan for possible new State Fairpark buildings, including a possible parking structure and pedestrian overpass over North Temple. If a parking structure is built, joint participation between the State Fairpark and UTA may be possible to accommodate park and ride passengers of the West-East LRT line.

**General Verbal Comment**

Comment: Like the idea of landscaping in center of 400 South with special left turn design.

Response: Urban design features, landscaping, and other amenities are all a part of the overall design of the West-East LRT system. This includes the design of 400 South which will accommodate left turn lanes on most north-south streets. It is not expected that there will be available room for landscaping in the center of 400 South.

**Hermoine Jex**

Comment: Salt Lake City transit decisions must be made for long term benefit of the community, not based on short term needs of the Olympics. We don't need West-East line for the Olympics... buses can be rented. Timing for West-East line is wrong now; too much other construction is going on. We need to wait until we can examine impact of the North-South line before building another one. Instead, we should pursue immediately the commuter rail line. Utah and Salt Lake City are and want to remain debt-free. We need to examine the capital cost of operation and cost of maintenance before we proceed. Real cost and revenues of West-East LRT are unknown, because we don't know what the actual construction costs will end up to be, nor do we know that the ridership will be like. The public needs to be made fully aware of the impacts of light rail. Cars are 82 feet long (twice as long as a bus) and can be connected in trains up to 492 feet (3/4 a block) long. Also the West-East line would run down 400/500 South, and stations would be too far apart, and too far from most people's homes to be used much. It is not safe to ride bikes to the train during the winter. West-East LRT will have unacceptable adverse impacts of North Temple viaduct and downtown intersections and left turn lanes. Problem with location LRT in center of street is that it interferes with left turns. Must examine some solutions: 1) disallow left turns across LRT tracks, 2) install pavement marking, signaling etc to allow traffic to merge into LRT lane and execute left turns (leads to many collisions in other cities), or 3) widen roadway to create separate protected left turn lanes at certain or all intersections.

You need to implement a citizens' destination survey in West-East Corridor. Elderly may use transit, but will not use it when carrying packages or groceries. Quotations about ridership from the DEIS make it appear that University students' travel patterns will not provide much potential ridership for West-East LRT. Quotations about ridership from the DEIS make it appear that airport employees' and patrons' travel patterns will not provide much potential ridership for West-East Corridor, they are scattered all over the valley. Most travelers either rent cars or utilize the shuttle buses provided by the hotels.

Response: The West-East LRT system is a vital link in the Salt Lake City area's overall transportation system, that includes a major roadway network, the North-South LRT line, bus transit service, freight and passenger rail, and eventually commuter rail service. The West-East LRT system will complement other transportation modes during the Winter Olympics 2002 and is a part of a multi-modal solution for that special event. Knowledge and experience have been gained as a part of the construction of the North-South LRT line; that knowledge and experience is being used in the preliminary engineering and design for the project. The West-East LRT line is not an extension of the North-South LRT line, but a separately functioning electric transit service that will serve riders to and from the airport, SLC downtown, and the University of Utah. UTA has developed a recommended funding scenario for the operation and maintenance of the West-East LRT system. Detailed costs for construction, operation and maintenance and projected revenues are included in Section 6 of the FEIS.

Typically, the LRT transit will run two or three LRT cars per train, not six cars per train. The LRT system will be designed to run within its own dedicated right of way separated from auto traffic and bicyclists by barriers. Signalized left turn lanes, and signalized crosswalks are a part of the LRT design to avoid left turn conflict autos.

It is not expected that many bicyclists would ride in the winter, just as few bicyclists ride currently (before LRT) in the winter.

Signals will be timed in such a way to optimize progression for all vehicles, both LRT, left-turning vehicles, and other vehicles. The alignment of LRT along 400 South has been shifted to the sides of the street to minimize conflicts with left-turning vehicles.

**John F. Bennett, Salt Lake Futures Commission**

Comment: Transmittal of Futures Commission statements on transportation.

Responses: Response to the Salt Lake Futures Commission is contained in Section 7.1.2 of this FEIS.

**Doug Dansie**

Comment: Alignment on 400 South enhances retail, encourages pedestrian traffic in retail area rather than residential, and lessens reliance on autos.

Response: Concur. See Section 2 and Appendix B for details on the evaluation of West-East LRT alignment options in downtown Salt Lake City.

## 7.1.2 Comment letters received from Local, State, and Federal agencies and responses.

The following pages present the comment letters received from local, state, and federal agencies, as well as the public and private stakeholders. Correspondence was received as part of the formal MIS/DEIS comment period from Primary Children's Medical Center, Salt Lake City International Airport, Salt Lake City Corporation, Utah Department of Transportation, U.S. Environmental Protection Agency, and Salt Lake Association of Community Councils. Each letter is presented first, with a corresponding response following the letter.

IHC

August 5, 1997

Doug Hattery
Wasatch Front Regional Council
420 West 1500 South, Suite 200
Bountiful, UT 84010

Dear Mr. Hattery,

1 It is our understanding that the preferred alternative selected in the Draft Environmental Impact Statement (DEIS) for the University-Downtown-Airport Major Investment Study, dated July 1997, is to construct a light rail transit line along the alignment illustrated as Alternative C (Figure 2-12) in the DEIS. It is also our understanding that the proposed eastern terminus of this line is at the University of Utah Medical Center, immediately adjacent to and south of Primary Children's Medical Center (PCMC). PCMC would like to go on record supporting this alternative.

2 While we recognize that inpatients and emergency patients are not likely to be significant users of public transit -- no matter the technology -- more than 94,000 visits are made to PCMC's outpatient clinics annually, and many children come here for routine medical services. We are convinced that the attractiveness, comfort, convenience, efficiency, and frequency of service that typify modern light rail systems will make transit the mode of choice for many of these trips.

Additionally, PCMC is a major employment center, with approximately twenty-one hundred employees. PCMC already subsidizes bus passes for employees, and with the improved comfort, travel times, and service frequency of light rail, particularly in evening and early morning hours, we believe that the number of employees taking transit will increase dramatically.

3 PCMC's Department of Pulmonology treats a dramatic number of children suffering from Respiratory Syncitial Virus and other conditions aggravated by airborne pollution each year. We would consider any measurable improvement in air quality significant -- particularly if this improvement could be achieved at the same time our transportation system is being enhanced.

4 On site parking is one of the greatest facility challenges we currently face. The residents of the historic neighborhoods surrounding our facility have concerns about the traffic coming to the hospital. At the same time, the demand for medical services at our facility continues to increase. Quiet, unobtrusive, neighborhood-friendly light rail is a viable way to help meet this increased demand without negatively impacting the neighborhoods that surround us.

For all of these reasons, PCMC supports the selected alternative.

Sincerely,

Joseph R. Horton

Joseph R. Horton, CEO

cc: John M. Inglish, Utah Transit Authority
Don Cover, Federal Transit Administration

**Reesponse to Primary Children's Medical Center, correspondence dated August 5, 1997.**

1. Concur. The Light Rail Transit (LRT) alternative is the proposed action for the Airport to University West-East Corridor. The LRT alignment is described in detail in Section 2 of this document.

2. The University of Utah including the Primary Children's Medical Center (PCMC) is one of the numerous special generators of ridership service along the West-East corridor. The West-East LRT system will provide a convenient, efficient mode of travel for many passengers going to and from the PCMC.

3. Concur.

4. The West-East LRT system is one part of a region-wide conforming long-range transportation plan with regard to air quality. Also, a carbon monoxide (CO) "hot spot" analysis was conducted as part of the technical analysis for the FEIS. Analysis results show that the West-East LRT project generally does not contribute to the degradation of the corridor's air quality in most location.

SALT LAKE CITY AIRPORT AUTHORITY



September 15, 1997

Doug Hattery
Wasatch Front Regional Council
420 West 1500 South, Suite 200
Bountiful, Utah
84010

Dear Doug,

1 Please be informed of the Airport Authority's comments on the July 1997 Draft Environmental Impact Statement for the University-Downtown-Airport Major Investment Study. In general, the Airport supports the proposed Airport-Downtown-University light rail connection. When Completed, the light rail will provide an important transportation alternative to the Airport and should help to reduce vehicle miles traveled throughout the community. We have included provisions for light rail in our recently completed master plan and can accommodate its development at any time. Our facilities are being designed to ensure that light rail and Airport development are compatible.

2 It is important this report acknowledge that airport funds can only be used to fund airport facilities. The following remarks relate to specific sections in the draft EIS.

3 1. The following figures do not show the new west runway that is now in operation:

| | |
|---|---|
| Figure | 3-1 |
| Figure | 3-2 |
| Figure | 3-3 |
| Figure | 3-5 |
| Figure | 3-7 |

4 2. Figure 1-2 shows the new west runway and a portion of airport property within the, "international center". Airport property should be included in the dark blue shaded "Airport" district.

Salt Lake City Airport Authority
AMF Box 22084 Salt Lake City, Utah 84122
801 575 2400 Fax 801 575 2679

5 3. Page 6-20, under, "Local Financial Commitment: Alternative B-Bus/HOV/TDM/TSM": (3rd paragraph)

> Corrections are needed to clarify the financial commitments possible from the Airport Authority. The text states, "the Authority...would be willing to provide land or a lease for land needed for bus transit centers and park-and-ride lots" on its property. Clarification should be made that the Airport is willing to provide a right-of-way for the light-rail corridor and stations only. The Airport has not committed to provide right-of-ways for separate park-and-ride lots and bus transit centers that are not a part of our development program. While the Airport may be able to provide the right-of-way needed for the LRT corridor, we cannot contribute funds to build separate park-and-ride lots or bus transit centers. The multi-modal ground transportation center, which is an integral component of the airport terminal and parking facilities, will be designed to connect to various transportation modes, including the LRT and bus. Please be advised that all agreements to provide right-of-ways must be in accordance with the regulations governing the disposal of property acquired using federal funds and those which prohibit the diversion of airport revenues.

6 4. Page 6-21, Under, "Local Financial Commitment: Alternative C-LRT/TDM/TSM," (The Airport Authority paragraph):

> All references suggesting that the Airport will invest in LRT in lieu of constructing parking should be deleted. Airport parking will be constructed as demand requires. If LRT reduces the demand for on-airport parking, then fewer spaces would be constructed - any savings created by building less parking can not be diverted to fund light rail.

7 Also, we are uncertain what the phrase, "provision of extra environmental mitigation credits for wetlands," means. In 1992, the airport implemented a wetland mitigation project to allow construction of its runway and terminal area. The Section 404 permit issued to the Airport, by the Army Corps of Engineers, does not have provisions for wetland impacts that might be associated with constructing light rail. The agencies implementing light-rail are fully responsible for obtaining necessary Section 404 permits and mitigating for wetland impacts.

8 Finally, correction is needed also regarding the interface between the LRT and airport roads. The text states, "They [the airport] have also designed an alignment for LRT on airport property that can be constructed without impacting the timing of construction of access roadways and other facilities." Although LRT can be constructed

independent of other projects, it does create additional impacts It is important to note that construction of LRT will require relocating the XBAR road. The Airport has no need to relocate the XBAR roacother than that which is created by the LRT. The cost to relocate theXBAR should be included in the total cost of the LRT project.

9 Second sentence from the end of this same section states, "as ocal math for the project" I believe this should read as local, "matct" for the project.

10 5. Table 6-11 Prospective Sources of Local Funding:

Number 1 should read, "Airport Land Lease ~~or Dedication of Riht of Way~~ for Corridor."

Number 3 should be deleted. The Airport does not plan to provide LRT investment in lieu of parking.

Number 4 should be deleted. Mitigation credits on the establised mitigation site are tied to airport related development projects uch as new runway, apron and terminal areas.

Please call me at 575-2231 if you need additional clarification on these item

Sincerely,

Allen G. McCandless
Planning Manager

cc: Steve Domino
Brian Hatch
John Wheat
Russ Widmar

**Response to Salt Lake City Airport Authority, correspondence dated September 15, 1997.**

1. As part of the public and stakeholder involvement for the West-East FEIS process, five working groups were organized to discuss project issues and concerns. The FEIS study team has been meeting regularly with the SLC Airport Working Group to discuss the SLCIA Master Plan and to ensure the West-East LRT system is compatible with the airport development. SLCIA representatives have also been an active part of the West-East Steering Committee.

2. UTA has developed the recommended funding scenario for the operation and maintenance of the West-East LRT system (see Section 6). Airport funds are not presently included in the UTA Financial Plan for West-East LRT construction, operation and maintenance.

3. The figures noted (Figures 3-1, 3-2, 3-3, 3-5, and 3-7) have been revised to include the new west runway.

4. Changes to Figure 1-2 have been made.

5. No park-and-ride lot nor bus transit center are planned on SLCIA property as part of the West-East Corridor project. The western terminus of the West-East LRT system will be a direct connection into the multi-modal ground transportation center. The current UTA Financial Plan does not assume that airport revenues will be used in the construction or right-of-way acquisition for the West-East LRT system. All proper federal procedures regarding right-of-way agreements will be followed.

6. Comments noted and revisions to the text have been made accordingly. UTA understands that providing adequate airport facility parking is the responsibility of the SLCIA.

7. As part of the additional technical studies for the FEIS, wetland delineations were conducted for the wetland areas between the I-80/airport access road and the UDOT roadway right-of-way line, which includes the West-East LRT ROW. Approximately 4.89 acres of wetlands will either be directly or indirectly impacted by West-East LRT construction. An individual U.S. Army Corps of Engineers 404 permit is being acquired as part of the West-East FEIS process. As mitigation to wetland impacts, mitigation credits will be purchased in a wetland mitigation bank.

8. Comments regarding the relocation of XBAR road are noted, and provisions are being made during the preliminary engineering (PE) phase of the project to facilitate the road's relocation as necessary.

9. Correction to text has been made.

10. Comments noted and corrections made to text as appropriate.

DEEDEE CORRADINI
MAYOR

# SALT LAKE CITY CORPORATION

OFFICE OF THE MAYOR

August 21, 1997

Wil Jeffries, Executive Director
Wasatch Front Regional Council
420 West 1500 South, Suite 200
Bountiful, Utah 84010

Jim Clark, Chairman
Utah Transit Authority
3600 South 700 West
Salt Lake City, Utah 84130

Gentlemen:

Thank you for forwarding to us copies of the Airport to University Major Investment Study/Draft Environmental Impact Statement. We commend you for the professional manner in which your staff and consultants have conducted this effort over the past year, including the high level of public participation that has been developed.

1 We are broadly supportive of the findings of this report. We agree that a light rail line that links the three largest traffic generators in the Salt Lake Valley is a natural. This line will serve residents of Salt Lake City, but to a very large extent it will also serve commuters of the entire region as they travel to, and between, these three major destinations.

The importance of this line will only become more apparent as a more-integrated transit system is developed that includes more buses, commuter rail from Brigham City to Payson, and light rail spurs to West Valley, West Jordan, Draper and Sandy. We believe all of these improvements are vitally necessary.

2 In particular, we believe that there is great potential to reduce neighborhood traffic as this system provides an attractive alternative to the automobile -- especially for those destined for the University of Utah. The current I-15 expansion, as well as the I-15 North and I-80 expansions that are being developed as we speak, have the potential to severely impact our neighborhoods.

3 It is impossible to overstate our opposition to commuters turning our neighborhood streets into major arterials. There is an absolute need for better transit, traffic calming, and other strategies to attack this growing problem.



451 SOUTH STATE STREET, ROOM 306, SALT LAKE CITY, UTAH 84111
TELEPHONE: 801-535-7704 FAX: 801-535-6331

However, we would like to note that there are four alignment alternatives that we believe require further analysis. Each has the potential to greatly improve the effectiveness of this system, and warrants further study in the Final EIS/Preliminary Engineering phase of this project's development.

From east to west, these alignment issues are:

1. Extend the eastern terminus through Research Park to the Hogle Zoo/This Is The Place Monument area. Research Park is a burgeoning employment center, and the Hogle Zoo/This Is The Place Monument area has over 1 million visitors per year. This alignment would also get much closer to the residential areas of the City's east area, providing better transit service for those neighborhoods.

2. Use 3rd South instead of 4th South through downtown. Now that 4th South will see greatly increased use as it becomes the location of a new I-15 off-ramp, concern has been expressed that this road cannot handle all the new traffic, plus light rail as well, until the line gets east of downtown.

3. Use Rio Grande Street instead of 4th West. Our Planning Division staff has long recommended looking at this alternative, particularly if Rio Grande Street can be extended north of 2nd South as a part of the redevelopment of the Union Pacific South Yard, located behind the historic U.P. train depot.

These two west downtown issues are being addressed in the City's Gateway Planning process, and recommendations from these studies should be available to you by the end of the year.

4 4. Extend the western terminus to the International Center. At the Planning Commission's May 5, 1997 hearing on this study, a representative of First Security Bank made a strong case that the line should be extended to the International Center, where there is a large concentration of transit-oriented employment. We know you have been meeting with International Center officials, and would request you continue these discussions. A strong transit connection to this area is vital.

5 We are aware of the time constraints on this study, and support the need to move the process along as quickly as possible. However, all four issues are of critical importance to us, and should be able to be resolved within the FEIS process by the end of the year. We encourage you to continue to work closely with us, our staffs, other agencies, and the public as you evaluate these issues.

In fact, this process has already begun. We were pleased to see all four of these alignment variations presented at the August 18th public hearing on the MIS/DEIS.

Again, thank you for the work that has been done on this study. We look forward to successfully completing this project.

Sincerely,

Deeda Seed
Council Chairperson

Deedee Corradini
Mayor

M. Bryce Jolley
Council Vice-Chairperson

cc: City Councilmembers
John Inglish, Acting General Manager, Utah Transit Authority
Doug Hattery, Wasatch Front Regional Council
Ralph Jackson, Vice President Parsons Transportation Group
Lou Mraz, Regional Administrator, Federal Transit Administration
Tom Nycum, Vice President, University of Utah
Cindy Gust-Jenson, Council Staff Director
Russell Weeks, Council Staff
Brian Hatch, Deputy Mayor
Russ Widmar, Airport Director
Bill Wright, Planning Director
Tim Harpst, Transportation Engineer

**Respoonse to Salt Lake City Corporation, correspondence dated August 21, 1997.**

1. Concur. The West-East LRT system alternative is the proposed action for the West-East Corridor. The West-East LRT system is only one link in an important multi-modal transportation system in the Wasatch Front region. This multi-modal system includes interstate, major arterial and other roadway improvements, HOV-lane construction (I-15), expanded bus transit service, the North-South LRT line, and a possible commuter rail line. Planning studies are underway to study potential LRT extensions into the areas of West Valley, West Jordan, Draper and Sandy. These potential extensions if selected for design and construction should enhance the service south of downtown on the North-South LRT line.

2. The West-East LRT system provides the opportunity for passengers to move between three Salt Lake City major generators (the airport, downtown, and the University of Utah) without the use of automobiles. Morever, Transportation System Management (TSM) and Travel Demand Management (TDM) strategies will be implemented along with the construction of the West-East LRT that should help reduce commuter trips in single occupancy vehicles.

3. As part of the additional technical analysis for the West-East Light Rail FEIS, LRT alignment options and extensions were evaluated in detail. These alignment options and extensions included 300 South instead of 400 South; Rio Grande Street instead of 400 West; and a possible extension of the eastern terminus through the Research Park to the Hogle Zoo and This is the Place State Park. As a result of this detailed evaluation, it was decided that 400 West and 400 South is the most appropriate alignment through downtown and the Research Park and Hogle Zoo area would be better served by a bus shuttle due to the diverse business locations and transportation needs (see Appendix B, for more detailed information).

   The West-East FEIS study has been coordinating regularly with the City's Gateway Planning process and has incorporated information from that process into this FEIS document.

4. A western extension to the International Center was also evaluated as part of the additional LRT alignment. Analysis results showed that an extension to the International Center may be a future extension of the West-East LRT, but not a part of this project. At the airport, a Y LRT track design will be constructed to accommodate a future extension to the International Center.

5. Salt Lake City representatives have been active participants of the West-East Corridor Steering Committee throughout the MIS/EIS planning and decision-making process.

UDOT

State of Utah
DEPARTMENT OF TRANSPORTATION

Michael O. Leavitt
Governor
Thomas R. Warne
Executive Director
Clint Topham
Deputy Director

4501 South 2700 West
Salt Lake City, Utah 84119-5998
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**DATE:** August 13, 1997

**TO:** John Njord, Engineer for Planning

**FROM:** Walt Steinvorth, Urban Planner W.S.

**SUBJECT:** Airport-Downtown-University DEIS - Comments

On August 12, 1997 during the subject team meeting part of the discussion focused on changing the eastern terminus of the project from the research park to the medical center and the impacts this change would have on ridership forecasts. During this discussion several issues were raised that do have an impact on transit ridership such as available parking at the research park and the type of visitor to the medical center. Plans for the research park include more than adequate parking which will undoubtedly encourage employees and visitors to the research park to arrive by automobiles. Also, it is perceived that many of the visitors to the medical center are indigents whose only means of transportation is transit. However, it was stated that the models would show little change in ridership with the terminus change.

The point of this note is to suggest that the trip generation for these zones be reviewed. I suggest first review the special generator rates for these zones and where and how they were derived. These rates typically come from one of two places, the Institute of Transportation Engineers, *Trip Generation Manual* or they come from and Origin and Destination Study. If they came from the Origin Destination Study, the rates are probably "OK," if they came from the *Trip Generation Manual* they could be trouble.

The *Trip Generation Manual* rates are vehicle rates obtained by counting vehicles entering and leaving a land use in one day. These studies careless about auto occupancies and arrivals by transit or said another way, person trips. The person trips are input into the special generator file of the trip generation model.

The second problem with using the manual for rates is that ITE may not have surveyed a large enough sample of the land use to have accurate rates. Also, the ITE rates may be inappropriate to use for one or both of these land uses at the terminus. For example, the ITE rates for a hospital could have been taken at a for-profit affluent suburban hospital while the medical center at the university is a training and research hospital that serves people at the other end of the social and economic ladder. These people have a higher propensity to use transit to travel to the center because it is the only mode available to them.

Assuming that the input rates were reviewed and verified there are a few more places to check, and these checks should be made no matter if the rates came from the ITE or O&D study. The land use rates for the research park and the medical center are attraction rates. The trip generation model balances trip attractions to productions since data for the production end of the trip is considered better than the attraction end. This means that the number of attractions gets clobbered in the final operation of trip generation. The special generator data for these zones may need to be inflated to actually get the appropriate number of attractions for these zones. Check the output of the transit assignment to determine if there are enough people boarding at the research park and the medical center. Also check the highway assignment to see if the traffic entering and leaving these zones is right.

Finally, it may not be a bad idea to review all the special generators for these problems.

CC: Doug Hattery, WFRC
Ralph Jackson, Parsons Transportation Group

**Response to State of Utah Department of Transportation, letter dated August 13, 197.**
The concerns expressed are valid concerns. However, the WFRC has recognized them and addressed each in their travel modeling procedures. The special generation rates used or the University of Utah, the University Health Sciences Center, Research Park, the Salt Lae City International Airport, and other special generators in the corridor were developed uing a combination of local information, including some traffic counts, as well as studies from othecities, such as Denver. The WFRC has made special efforts to ensure that reasonable estimtes of productions and attractions are obtained for all these special generators and that the cocerns expressed in the comment relating to different rates for different types of facilities are addres. In regard to the second comment, the with the recent updates to the WFRC's travel modes, the adjustments required to trip attractions is not great. Again, the WFRC reviewed the model esults and found them to be reasonable.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2466

OCT 2 3 1997

Ref: 8EPR-EP

Doug Hattery
Wasatch Front Regional Council
420 West 1500 South, Suite 200
Bountiful, Utah 80410

Re: University-Downtown-Airport Transportation Corridor, Salt Lake City, Utah Draft Environmental Impact Statement

Dear Mr. Hattery:

In accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, the Region VIII Office of the Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement (DEIS) for the referenced project.

1 In general, the document is well written and provides substantial interrelated information with the many other transportation initiatives planned and proposed for the Salt Lake City Region. We agree that the proposed action and the preferred alternative, Alternative C-Light Rail Transit/Travel Demand Management/Travel System Management, can be implemented with mitigation to meet the described purpose and need.

2 We do have two concerns that need to be addressed. On pp. 5-41, the sentence on the top of the page states "(The) six intersections that should be analyzed for potential air quality impacts are listed in the following table:" Table 5-13 does list the six intersections but there is no accompanying air quality impacts analysis. It appears this information is missing.

3 Our second concern is that construction impacts for LRT are not discussed in this DEIS. Will any residences be impacted by air pollutants due to construction activities. What measures will be taken to mitigate fugitive dust during construction? Will the diesel exhaust from gravel/dirt hauling trucks impact nearby residential areas. These issues need to be addressed in the FEIS.

4 Based on the procedures the EPA uses to evaluate the adequacy of the information and the potential environmental impacts of the proposed action and alternatives in an EIS, the EPA Region VIII rates this DEIS as Category EC-2. This means that additional information, as noted, would allow us to more fully assess proposed action environmental impacts. A copy of our rating criteria is attached.

You will note that this review is past the requested comment date. Unfortunately we did not receive the document for review until after the comment period had closed. We appreciate the opportunity to review and comment on the DEIS. Should you have any questions, please contact Mike Hammer of my staff at (303) 312-6563.

Sincerely,

Carol L. Campbell

Carol L. Campbell, Director
Ecosystems Protection Program

cc: Pat Haman, OFA EPA-HQ
Robert Edgar, 8EPR-PS

## SUMMARY OF RATING DEFINITIONS AND FOLLOW-UP ACTION*

### Environmental Impact of the Action

LO-Lack of Objections

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC-Environmental Concerns

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

EO-Environmental Objections

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU-Environmentally Unsatisfactory

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of environmental quality, public health or welfare. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommend for referral to the Council on Environmental Quality (CEQ).

### Adequacy of the Impact Statement

Category 1-Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2-Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS

Category 3-Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

*From: EPA Manual 1640, "Policy and Procedures for the Review of Federal Actions Impacting the Environment."

**Response to U. S. Environmental Protection Agency, Region VIII, letter received October 23, 1997.**

1. Concur.

2. As part of the additional technical analysis for the FEIS, a carbon monoxide (CO) "hot spot" analysis was conducted for the West-East LRT alternative and the No-Build alternative for six intersections. The result of that detailed analysis is included in Section 5.13 of the FEIS. After further traffic analysis four of the six intersections noted in the MIS/DEIS were changed to other intersections that represented "worst case" conditions with regard to traffic congestion. The six intersections analyzed for the air quality, CO hot spot analysis are listed in Section 5.13 of the FEIS.

3. Construction impacts, specifically fugitive dust and truck exhaust concerns and mitigation measures are discussed in Section 5.18 of the FEIS.

4. The West-East Light Rail FEIS study team has responded fully to the issues and concerns raised by the USEPA in the FEIS document, and the lead agencies have coordinated with USEPA staff during the MIS/EIS planning and decision-making process.

Salt Lake Association of Community Councils
P.O. Box 522038
Salt Lake City, UT 84152-2038
(801) 575-5456

September 8, 1997

Doug Hattery
Wasatch Front Regional Council
420 West 1500 South, Suite 200
Bountiful, Utah 84010

Dear Doug Hattery,

Enclosed are some community council positions and comments on the MIS/DEIS of the Airport-Downtown-University Transportation Corridor due September 15,1997.

In August community council representatives spent hours in reviewing the document which favored the LRT in the E/W corridor and thus declared some questionable/ faulty statements against 'No-Build' that needed careful review. We prepared a seven page list of tentative concerns and questions and studied them carefully. In September we prepared a final document which is enclosed.

We thank you for this opportunity to give public input.

Sincerely,

Hermoine T. Jex

Hermoine T. Jex, secretary
272 Wall Street
Salt Lake City, Utah 84103
Phone: 364-5326

POSITION STATEMENTS OF COMMUNITY COUNCIL REPRESENTATIVES ON THE MAJOR INVESTMENT STUDY/DRAFT ENVIRONMENTAL IMPACT STATEMENT (MIS/DEIS) OF THE AIRPORT-DOWNTOWN-UNIVERSITY TRANSPORTATION CORRIDOR - September 1997

1. The Salt Lake City transit issues must be resolved by fulfilling long range and on-going community need, and not primarily by the short term for the Winter Olympics in 2002. Then transit bus service can be hired to deal with transporting personal to all the Olympic venues, the majority outside of Salt Lake City. Wise decisions must be made for the years of transit use along the Wasatch Front and not for the Olympic glory in a one month time period.

2. The timing is all wrong for development of a rail system from the airport to the U of U. I-15 will be ripped up for multi-months to come. The North/South LRT will impact many streets for a long period of time. Streets are being repaired, new highways cut through. At this time Salt Lake City cannot take any more basic major changes through its city. We need to wait to examine the impacts of the N/S LRT on our city before we commence planning any extensions. We do not need it for the Olympics. Buses can be recruited. Instead plan immediately for the needed Commuter Rail along the Wasatch Front and establish a workable practical route prior to October 15, 1997, a UDOT Gateway deadline, so that the 400S/500S/600S viaducts will not touch down at the wrong locations. We still need the right train on the right track.

3. Utah/Salt Lake has and wants to remain debt-free, but now finds itself deep in the 'bonding' game. The public has not received and perhaps sufficiently requested a full accounting of our financial status. Now we need to examine closely the Capitol Cost and Operation and Maintenance costs of the E/W LRT which is listed in report as $374 million Capitol Cost and $30 million annual, and it could cost much more. We don't know what the ridership will be, and how much revenue will be coming in. We feel that buses will be more cost effective and flexible. The real costs of the LRT are still unknown factors.

4. The public should be made fully aware of what the Light Rail is, and the impacts it will cause. LRT cars are 82 ft. long and 8½ ft. wide. (Buses are 40 ft.) "Cars can be coupled in trains up to 6 units". (p. 2-8 DEIS) This would total 492 ft, about 3/4 of a block. LRT cars would be on a double track with a 16 ft. wide station between at selected locations. LRT stations are not as conveniently located as bus stops. "LRT stations will be located approximately ½ mile apart. This spacing is required in order to maintain acceptable travel times and control cost for stations. There will therefore be fewer potential passengers that are within a reasonable walking distance of an LRT station." "Passengers who are not within walk access of an LRT station may choose to ride a bike to access the system." (p.2-44 DEIS) Stations on 400/500S are located (2-12) on 200W, Main, 200E, 700E, 1100E, University Ave.,Stadium, Ft. Douglas, Wasatch Drive (west hospital). Latter will need to take a U. shuttle bus to get to main hospital. One can see from a map that majority of people live many many blocks from the LRT proposed E/W corridor. Also it is unwise to ride bicycles in our winter months. And LRT poles, wires, tracks are not attractive visible elements in the streetscape..."until people become used to them."

5. The big issue on the E/W Corridor for LRT deals with the 25 intersections and left turn lanes located east of North Temple and 400 W. First there is the negative impact of LRT on the North Temple viaduct, and then the continuing adverse impact as the route transverses through 400 West (drawn as an Olympic Boulevard with trees down the median) to 400 South where the LRT tracks/cars will interfer with the vast 400 South new interchange traffic. Even if 300 W is substituted from 400 W to Main, there will still be the impact. As the route goes eastward it intersects major streets all the way to the University and satisfactory solutions have not been found for intersection impact and left turn lanes.

   The DEIS states "The levels of service at intersections in Downtown are of critical interest to commercial and residential populations. Therefore the Downtown option selected must allow for an acceptable level of service at the intersections affected by LRT operations. Traffic on Main Street is already affected by the N/S LRT line. Option F, which would share the Main Street N/S line, would impact traffic on Main St/ even further, resulting in an unacceptable level of service at intersections from 400 S to South Temple. Traffic operations analysis to accommodate the N/S LRT on Main has demonstrated that frequency of LRT trains has an impact on the ability to handle left turns at the intersections. Adding a second LRT line would increase the frequency of LRT trains and further limit capacity for left turns." (2-19)

   "The light rail corridor is typically 28 ft across between stations and widens out to 39 ft at each station. The width of street right-of-way required at a station will require significant adjustments in existing street geometrics. It may even require widening of the street within the existing right-of-way. Once LRT is constructed it will be more difficult for left turning movements to be negotiated by traffic running parallel to the LRT lines. The left turning lanes will be located in the "shadow" of the Light rail station. A protected left turn phase will be required to facilitate this maneuver which may result in a lower level of service for the affected intersections which do not already have a protected phase." (2-43/44)

   "The primary difficulty with locating LRT in the center of the street is the impact on dedicated left turn lanes at the intersections. Three basic alternatives are available to solve this problem: (1) Do not allow left turns and eliminate the conflict. (2) Install pavement marking, signing and special traffic signals to allow traffic to enter the LRT lane and execute left turns. This solution has been implemented in several other cities where LRT is in operation, but bus/LRT collisions occur on a frequent basis. Further analysis would be required during preliminary and final design to develop a solution that minimizes the conflict and accident potential. (3) Widen the roadway at intersections to create a separate and protected left turn lane. This solution can be constructed within the existing right-of-way, but the curb lines would need to be up to 116 ft apart compared to the existing 100 ft. All of the widening would still be within the existing 130 ft right-of-way. Park strip, sidewalk and possibly some trees would need to be eliminated or relocated to construct this alternative." (4-8 DEIS) Conclusion: E/W LRT will cause critical negative impacts without satisfactory solutions.

6. Perhaps it is time to implement a citizen's destination survey of those who use the E/W corridor. It could be an open survey in the newspapers requesting citizens list home area, method of travel (car, bus, walk), through what streets, and for what purpose (school, shopping, meetings, work). The report states, "The East Central area also has a growing elderly population who, in order to protect their independence and mobility, would likely become increasingly dependent on public transportation." (2-20). It seems time to check on auto dependency of those over 65. They cannot or decline to carry packages or groceries very far such as on a bus or LRT. They use their cars.

"Residential development with more than 15 people per acre has not increased appreciably and amounts to about 4% of low density suburban land use. Such relatively low densities can make transit systems less practical, as some transit modes require high concentrations of users in order to serve their intended riders effectively. A second land use pattern that increases auto dependence is the separation of commercial and residential uses. Commercial/industrial use has spread but is not what one could call interspersed." (p. 1-12)

"Although UTA buses going to the University appear to be full, nearly 70% of faculty and students drive an automobile to reach the campus, while about 12% ride public transit. The remainder walk or travel by bicycle. Factors contributing to this include the U of U being a commuter campus where many of the students follow a triangular travel pattern (home-school-work-home), which makes it difficult to rely on public transit, particularly in the late evening." (p. 1-11)

Thus it appears Salt Lake does not have the potential ridership for an E/W LRT.

7. There is a need to analyze destination routes to the Airport. "Today, at the Airport, 60% of the enplanements have local origins, and 40% transfer from another flight. Employment at the Airport is also increasing. Almost all of these employees arrive at the Airport by auto and need parking." (p.1-16) But what are their home locations? How many live within walking access to a possible E/W LRT station? The DEIS report did not mention that the vast majority of travelers who come here, rent cars so they travel 'in many directions' for many purposes. Those who take friends and relatives to the airport with all their luggage cannot or will not take buses or trains. Hotels have their own service system to the Airport. And how is the taxi business? It is doubtful that an LRT to the Airport will serve the need of this community at this time. People are too scattered over too wide a distance. Though the report states, "This alignment provides excellent access to the Utah State Fairpark" (5-5), it is just as convenient to go by bus or car, the present status.

8. Therefore, because of these various positions the community council representatives are of the opinion that LRT for the E/W corridor is at this time too impractical, untimely, costly, will cause major negative impacts, and is not a top priority in the Salt Lake transit system. Improved bus service and additional buses can accommodate and service the area sufficiently and economically.

**Response to Salt Lake Association of Community Councils, letter dated September 8, 1997.**

1. The West-East Corridor LRT alternative is one important part of a comprehensive regional long-range transportation plan that includes major roadway improvements, enhanced by transit service, the North-South LRT line, and Commuter Rail. Once constructed, the West-East LRT line will be a vital link in the regions transit system and serve area residents well beyond the Winter Olympics in 2002.

2. The West-East LRT line is not a extension of the North-South LRT line, but a separately functioning electric transit service that will serve riders to and from the airport, downtown, and the University of Utah. The West-East LRT line is a vital link in the core LRT system for the Salt Lake City area. The impact of this LRT system has been evaluated in the FEIS. The feasibility study of commuter rail is a separate study and will serve other long-distance commuters to the Salt Lake City area.

3. The construction of the West-East LRT line will be 100 percent federally funded. UTA has developed a recommended financial strategy for the operation and maintenance of the West-East LRT system (see Section 6 of the FEIS). A comparative analysis of several bus transit alternatives, including the bus alternative addressed in the MIS/DEIS was completed as part of the West-East Corridor study. In the long-term, the LRT system showed to be more cost effective due to the need to replace more buses more often over a period of time (see Appendix A).

4. Initially, it is anticipated that only two or possibly three LRT vehicles would be linked together during peak hour periods. Stations are being designed to accommodate up to four cars per train in the future. The spacing of the LRT stations in the downtown area are within four blocks (or less) of each other. Therefore, potential riders of the West-East LRT line will be generally within a two block walking distance to an LRT station. Also, bicyclists will be accommodated in the LRT design in several ways: integration of existing bike paths as much as possible, accessability at LRT stations, and permitting bicycles on the LRT vehicles. Also, existing bus transit will be adjusted to better interface with both the North-South LRT and the West-East LRT lines. This will help accommodate passengers who live farther away from the West-East LRT line. They will be able to transfer conveniently from bus transit to LRT.

5. A detailed traffic analysis has been completed for the West-East Corridor study, especially for the 400 South alignment. The results of that study show that left turns into the downtown area from 400 South will be accommodated with the proposed West-East LRT design. The LRT system will be within its own dedicated ROW and signalized intersections will be timed to allow left turning movement for auto traffic.

6. The construction of the West-East LRT system will provide travelers and residents of Salt Lake City with the option of traveling to and from the airport on the transit system.

7. Comment noted. The West-East LRT line will provide a convenient, effective mode of travel for many Salt Lake City residents and will provide a vital link in the region's overall transportation system.

## 7.2 FEIS PUBLIC INVOLVEMENT

### 7.2.1 Introduction

Public and stakeholder involvement has been an important component of the decision-making process for the West-East Transportation Corridor in Salt Lake City. This has been especially true as the project move forward in the preparation of the Final Environmental Impact Statement (FEIS) and Record of Decision (ROD). As a result of comments received on the Major Investment Study/Draft Environmental Impact Statement (MIS/DEIS) and input received during agency coordination, issues and questions were raised that have been addressed by the project study team. Each public participant, each agency has unique interests and perspectives as to what the transportation solution for the West-East Corridor Study should be. Therefore, input from residents, public and private interests and regulatory agencies was sought throughout the FEIS process. The FEIS public involvement plan continued the information exchange and communication links that were formed during the MIS/DEIS phase (see Appendix F for plan details). Moreover, it was designed to create new opportunities for discussion and dialogue with project decision makers, about planning and design issues specific to the locally prefered alternative (LPA), a light rail transit (LRT) system.

### 7.2.2 Purpose of Plan

The purpose of the FEIS public involvement plan was threefold:

1. To effectively respond to MIS/DEIS comments received from the public and agencies and address issues resulting from those comments by way of additional study of evaluation;

2. To continue the public involvement process established during the MIS/DEIS phase so project information can continue to be exchanged and interaction with the public can occur;

3. To create focused discussions and dialogue via working groups on specific planning and design-related issuers that need to be resolved, as well as on important community needs and interests.

### 7.2.3 Plan Continuation

In order to continue active public participation in the planning and engineering studies for the West-East Transportation, the two major focuses of the DEIS public involvement plan, the Information Exchange and Steering Committee, continued throughout the FEIS phase. The information exchange provided the foundation of the public involvement process. The goals of the information exchange continued to be:

- To provide diverse groups with equal access to information, and provide access to project planners and engineers;
- To communicate public concerns and possible solutions to the study team and Steering Committee members; and
- To reach informed consent on the optimal design and alignment location of the locally preferred alternative, an LRT system.

Replies to correspondences, informational requests, and a world wide web site set up for the project continued as part of the FEIS Information Exchange. Community presentations and stakeholders meetings, such as local officials, civic, neighborhood organizations, occurred as requested. To keep the public updated on the FEIS process, two newsletters were published and distributed to the established project mailing list. Names of interested persons were added to the mailing lists throughout the FEIS phase. The newsletters included, but were not be limited to, information on major issues regarding LRT project development and how those issues are being resolved. They also included updates on the project status, schedule, and results of studies. Moreover, it included contact names and phone numbers for project planners as appropriate, notices of upcoming meetings, and other ways the public could actively participate in the FEIS process. Residents, public officials, community leaders and agency representatives had ample time to ask questions and comments on issues as part of the Information Exchange.

The Steering Committee continued to lead the West-East Transportation Corridor Study and the FEIS decision making process. Regular monthly meetings on important project issues continued to occur until the FEIS Record of Decision and the end of the study. The meetings provided a forum for key agency representatives to discuss project issues and LRT planning and design elements.

### 7.2.4 Stakeholder Involvement/Working Groups

There were a myriad of residents, property owners, business interests, agencies and groups that had an interest in the West-East Transportation Corridor Study. As a result, the study team organized working groups consisting of business owners, residents and other interested parties potentially affected by the location of the LRT. These working groups served as forums for discussions and dialogue. Five working groups were established for the West-East Corridor and they worked independently on issues specific to their area's interests and needs. Project planners kept each group informed of the other working groups efforts. The five groups were:

- Airport and International Center
- North Temple
- Downtown (which includes the Gateway and CBD)
- 400 South
- University and Research Park

The overall objectives of the working groups were: (1) to identify planning, urban design and other issues specific to their group's concerns; (2) to discuss opportunities and ways to resolve those issues; and (3) to act as advisors to the study team, so project planners can develop creative solutions to planning and design issues. Each working group met regularly throughout the FEIS process. The study team assisted in the facilitation and documentation of each working group meeting.

In each subarea, a working group gathered public input and discussed conceptual design and operational alternatives. As already noted, each group included stakeholders from the area including business owners, residents, neighborhood council representatives, and representatives of the University and airport. A complete list of working group members and contact documentation can be acquired by writing to Wasatch Front Regional Council.

Technical consulting and city staff attended the meetings to inform the group of the latest technical analysis and related findings. This included information on environmental impacts such as wetlands, historic structures, and traffic impacts along the alignment. In addition, preliminary design issues, such as LRT station locations and LRT track cross-sections, LRT vehicle and auto traffic integration, and pedestrian safety were discussed. Much of the discussion in the North Temple, downtown, and 400 South working groups focused on the potential impacts to business along the alignment during the construction phase of the proposed project. Station locations and related impacts to turning movements were another predominant topic. Study team members documented the public input received, and incorporated changes into the design as appropriate based on working group discussions.

**Airport Working Group**

Coordination with Salt Lake City International Airport (SLCIA) representatives has been ongoing throughout the DEIS and FEIS process. Coordination meetings with the Airport working group occurred on February 19 and March 18, 1998 at the airport. Discussion topics included the airport's master plan update, new terminal development plans including the proposed transportation center, LRT connections and the western terminus station location, safety and security issues, and potential LRT construction impacts on airport property. Coordination meetings resumed again in July and they included discussions with the airport master plan architects related to the LRT alignment, profile, and cross-sections on airport property as the West-East LRT system approached the proposed transportation center. Continued coordination with SLCIA staff and consultants is planned throughout the design phase of the project.

**North Temple Working Group**

Meetings with working group members were held on the following dates at the State Health Department:

February 19, 1998
March 18, 1998
April 1, 1998
April 15, 1998
May 13, 1998
June 10, 1998

During those meetings, working group members discussed roadway lane configurations and station locations on North Temple, and safety issues at crossings where people may make unsignalized left turns over LRT tracks. Project engineers explained that left turns can be allowed at signalized intersections. The working group also discussed LRT station configurations and design, crosswalks, turning lanes, and platform accommodation for wheel chair access. Also, ticket vending options, and potential free-fare zones similar to current system on buses. The working group also discussed the existing bus stops and future stops and routing to accommodate North Temple passengers. Coordination with North Temple businesses owners is planned to continue through final design and construction of the West-East LRT system.

**Downtown Working Group**

Meetings were held on the following dates at City Hall:

February 24, 1998
March 10, 1998
March 24, 1998
April 21, 1998
May 5, 1998
May 26, 1998
June 16, 1998

During these meetings, the working group discussed the downtown area from 600 West/North Temple to 400 South/200 East. The group also discussed the need to either realign the viaduct over or under railroad at North Temple; or construct an independent structure to carry the LRT over the railroad tracks. The working group also discussed station locations at 400 West and South Temple and at 300 South, and between West Temple and Main Street on 400 South. Other potential station locations for downtown were also discussed. The working group also discussed transfer opportunities between North-South LRT and West-East LRT at 400 South/Main Street at 400 West/South Temple, and the construction schedule of the proposed project. The potential LRT construction impacts to downtown businesses and property owners were also addressed. Coordination with downtown stakeholders will continue throughout the design and construction phases of the project.

**400 South Working Group**

Meetings were held on the following dates and locations as noted:
February 17, 1998 at Salt Lake City Chamber of Commerce
March 17, 1998 at Salt Lake City Chamber of Commerce
March 31, 1998 at Salt Lake City Chamber of Commerce
April 19, 1998 at Salt Lake Roasting Company
May 12, 1998 at Le Parisian
June 9, 1998 at Le Parisian

During these meetings, the working group discussed possible mitigation strategies for potential construction impacts. Concerns were raised by 400 South business owners regarding construction impacts. Current issues with North-South LRT construction on Main Street were noted. The group also discussed station locations between 200 and 300 East, 600 and 700 East, 800 and 900 East and 1100 and 1300 East. The potential for a split station at Main Street was discussed as well as the construction schedule of West-East LRT project. Coordination with business owners on 400 South will continue throughout the design and construction phases of the project.

**University Working Group**

Meetings were held with key University of Utah staff on the following dates at the University Services Building:

January 15, 1998
January 28, 1998
February 25, 1998
March 25, 1998
April 29, 1998
May 27, 1998
June 24, 1998

During these meetings the working group discussed the proposed LRT alignment through the University campus. Possible extensions of LRT near Fort Douglas to the Research Park were also discussed. The group discussed potential station sites at the Rice-Eccles Stadium, the Fine Arts Museum, the Huntsman Center, and the eastern terminus at the Health Sciences Building. Several presentations about the West-East LRT project were made at the University's monthly open forum meetings that are open to area residents as well as University faculty and staff. Coordination with the University will continue throughout the design and construction phases of the West-East LRT project.

### 7.2.5 Public Information Open Houses

The two open houses were held as an opportunity for concerned residents and business owners along the alignment to learn more about the proposed project and potential impacts to their properties. Study team members went door-to-door along the length of the alignment and handed out flyers inviting people to attend, giving information about the project, and giving the following times and locations:

| | | | |
|---|---|---|---|
| May 19 | 5-8 p.m. | Wasatch Elementary School | 30 North "R" Street, Salt Lake City |
| May 21 | 5-8 p.m. | West High School | 241 North 300 West, Salt Lake City |

The open houses were attended by representatives of UTA, WFRC, Parsons Transportation Group Salt Lake City Planning Division. Six members of the public attended the May 19 open house, and one member of the public attended the May 21 open house. The public comments from the meetings can be found by contacting the Wasatch Front Regional Council.

## 7.3 AGENCY COORDINATION AND FOLLOW-THROUGH ACTIONS

Close coordination with the resource and regulatory agencies occurred throughout the FEIS process. Issues, concerns and potential environmental impacts that were identified during the MIS/DEIS process as well as those raised during agency coordination meetings were addressed during the FEIS study. All agencies were kept informed as to the project's status, schedule and results of the environmental analysis. In some cases, such as the U.S. Army Corps of Engineers, permitting requirements and time lines were discussed and integrated into the overall project schedule. This list of agencies includes, but is not limited to:

- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife
- U.S. EPA, Utah Region Office
- U.S. Department of Agriculture (Natural Resources Conservation Service)
- Utah Department of Environmental Quality
- Utah Department of Natural Resources
- Utah State Historic Preservation Officer
- Utah Division of Air Quality
- Utah Department of Transportation

Summaries of individual agency meetings were documented. Agency follow-through occurred during the FEIS phase of the project, such as sending them regular project mailings or newsletters and handling agency questions and information requests as quickly as possible.

### 7.3.1 Agency Coordination Letters

On March 24, 1998, an agency coordination letter was sent to all local, regional, state and federal agencies informing them of the proposed West-East LRT project, the project status schedule, and the FEIS technical study being conducted. A detailed list of the agencies contacted is available upon request. The March 24, 1998 coordination letter also invited the agencies to respond by relating any concerns, or project issues they would like to see addressed during the FEIS phase of the West-East Corridor Study. Nine response letters were received. The nine agencies that responded are listed below along with the comment or concern expressed.

| Agency | Date of Letter | Comment or Issue |
|---|---|---|
| U.S. Army Corps of Engineers | April 28, 1998 | Potential wetland impacts at airport; also east end of corridor if alignment should cross Red Butte Creek; all impacts must be minimized and mitigated. |
| U.S. Department of the Interior, Fish and Wildlife Service | April 21, 1998 | Potential wetland impacts at airport; concern of the wildlife habitat loss. |
| Utah Department of Environmental Quality, Division of Air Quality | June 10,1998 | Support alternate modes of transportation including light rail transit; issue of fugitive dust. |
| Utah Department of Natural Resources, Division of Wildlife Resources | March 31, 1998 | Wetland impacts and associated loss of wildlife habitat. Minimize impacts to wetlands and mitigate. |
| Utah Department of Natural Resources Division of Water Rights | March 26, 1998 | Include streams on maps and plans. |
| Utah Department of Environmental Quality, Division of Environmental Response and Remediation | April 3, 1998 | CERCLIS sites in West-East Corridor. |
| Salt Lake County Public Works Department | March 27, 1998 | No issues or concerns. |
| Salt Lake City/County Health Department Environmental Health Division | April 17, 1998 | Supports alternate mode of transportation for air quality reasons; noise during construction; minimize health and safety risks. |
| University of Utah | March 31, 1998 | Impacts to Red Butte Creek if crossed; LRT potential to reduce traffic campus. |

As a result of the technical analysis conducted during the FEIS phase, the issues and concerns raised by the agencies have been addressed in this FEIS. See appropriate sub sections in Section 5 of this document for specific details as to the potential environmental impacts due to LRT construction and the associated mitigation measures to reduce those impacts.

### 7.3.2 Agency Approval Letters

As a result of extensive agency coordination throughout the FEIS process on key project issues several agency approval letters are anticipated for the West-East LRT project. The following agency letters will be received and included in the FEIS before issuance: the U.S. Army Corps of Engineers, Utah State Historic Preservation Office, and the Utah State Department of Environmental Quality (Division of Air Quality).

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, SACRAMENTO
CORPS OF ENGINEERS
1325 J STREET
SACRAMENTO, CALIFORNIA 95814-2922

REPLY TO
ATTENTION OF

April 28, 1998

Regulatory Branch (199250136)

Doug Hattery
Wasatch Front Regional Council
4210 West 1500 South, Suite 200
Bountiful, Utah 84010

Dear Mr. Hattery:

This is in response to your letter of March 24, 1998 inviting comment on the proposed light rail transit alignment. These comments are intended to supplement those comments provided to you by letter dated January 27, 1998.

The proposed alignment has been reviewed in light of Section 404 of the Clean Water Act, under which the Army Corps of Engineers regulates the discharge of dredged and fill material and excavation in waters of the United States, including wetlands. For most of its length, the proposed alignment goes through developed areas where there is little potential for impacting Section 404 jurisdictional waters. There are, however, several jurisdictional streams in the vicinity of the University of Utah and Hogle Zoo, which the alignment crosses. Additionally, there is extensive wetland acreage in the vicinity of the airport, particularly west of the airport. A Department of the Army permit will be required for any fill placement or excavation in these streams and wetlands or in any other streams and wetlands along the alignment. As stated in my previous letter, the Corps of Engineers can permit only that alternative which will result in the least damage to the aquatic environment. For this reason, project proponents must be able to substantiate that total avoidance of impacts to the aquatic environment is not possible. Impacts that can not be avoided must be minimized and mitigated.

If you have any questions, please contact Dennis Blinkhorn, at the Utah Regulatory Office, 1403 South 600 West, Suite A, Bountiful, Utah 84010, telephone (801) 295-8380, extension 12.

Sincerely,

Michael A. Schwinn

Michael A. Schwinn
Chief, Utah Regulatory Office

Enclosure

# United States Department of the Interior

FISH AND WILDLIFE SERVICE

UTAH FIELD OFFICE
LINCOLN PLAZA
145 EAST 1300 SOUTH, SUITE 404
SALT LAKE CITY, UTAH 84115

In Reply Refer To:
(CO/KS/NE/UT)

April 21, 1998

Mr. Doug Hattery, Project Manager
Wasatch Front Regional Council
420 West 1500 South, Suite 200
Bountiful, Utah 84010

RE: Light Rail Transit -- Airport to University West-East Corridor Study

Dear Mr. Hattery:

We have reviewed your letter of March 4, 1998, regarding the proposed alignment corridor for the west/east light rail transit (LRT). While much of the corridor seems to be located within developed areas, along existing roads, it is unclear to what extent impacts to wetlands will occur. Sections of the alignment to the west of Redwood Road, particularly west of the airport appear to have high potential for wetland impacts.

Despite limited geographic extent in Utah, wetlands provide extraordinary wildlife habitat and should be evaluated accordingly. We would be concerned with any loss or degradation of wetland habitats. We believe your assessment of this project should include identification of wetland habitats and associated fish and wildlife which would be impacted by each of the proposed alternatives. This would enable a comparison of alternatives, identification of the most environmentally preferred alternative, and identification of appropriate mitigation to offset unavoidable impacts.

We appreciate the opportunity to provide comments. If we can be of further assistance, please contact Laura A. Romin, Wildlife Ecologist, of this office at (801) 524-5001, ext. 142.

Sincerely,

Robert T. Williams Acting

Reed E. Harris
Field Supervisor

cc: Mr. John Kimball, Director, Utah Division Wildlife Resources, 1594 West North Temple, Suite 2110, P.O. Box 146301, Salt Lake City, UT. 84114-6301

# State of Utah

DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY

Michael O. Leavitt
Governor
...ne R. Nielson, Ph.D.
Executive Director
Ursula K. Trueman
Director

150 North 1950 West
P.O. Box 144820
Salt Lake City, Utah 84114-4820
(801) 536-4000 Voice
(801) 536-4099 Fax
(801) 536-4414 T.D.D.

June 10, 1998 DAQS-0137-98

Doug Hattery, Project Manager
Wasatch Front Regional Council
420 W. 1500 S., Suite 200
Bountiful, Utah 84010

Dear Mr. Hattery:

RE: Environmental Comments on the University, Downtown, and Airport Light Rail Transportation Corridor Draft EIS/MIS

Thank you for your letter of March 24, 1998, and for the opportunity to comment on the University, Downtown, and Airport Light Rail Transportation Corridor Draft EIS/MIS. The Utah Division of Air Quality supports alternate modes of transportation including light rail, car pools, van pools, buses, bicycle and pedestrian facilities. The completion of this project will help to further implement State Rule R307-11 which requires all government agencies to implement an employer based trip reduction plan. We encourage you to consider planning this project in such a way as to maximize the use of ***all*** available alternate transportation modes.

We remind you that during the actual construction of this project, your contractors must comply with the State Rule R307-12, and implement dust control strategies to prevent fugitive dust from leaving the work-site and spillage of materials on paved surfaces that would create fugitive dust. Planning construction activities to prevent and control fugitive dust is cost effective.

We appreciate this opportunity to comment on the light rail project, and we look forward to working with you to develop an environmentally sound transit system.

Sincerely,

Ursula K. Trueman, Director

UKT:RM:sbq

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE RESOURCES

Michael O. Leavitt
Governor
Ted Stewart
Executive Director
John Kimball
Division Director

1594 West North Temple, Suite 2110
PO Box 146301
Salt Lake City, Utah 84114-6301
801-538-4700
801-538-4709 (Fax)
801-538-7458 (TTY)

March 31, 1998

Mr. Doug Hattery, Project Manager
Wasatch Front Regional Council
420 West 1500 South, Suite 200
Bountiful, Utah 84010

Subject: FEIS for the Airport to University West-East Corridor Study

Dear Mr. Hattery:

The Utah Division of Wildlife Resources (UDWR) has reviewed the general Light Rail Transit (LRT) alignment map which you recently submitted to our office. The majority of the proposed alignment appears to follow existing road corridors and should have minimal impact to wildlife resources. However, the section of alignment from the airport to approximately 2400 West may include the crossing and/or filling of a significant number of wetlands. Even though this route appears to follow the existing road corridor, UDWR is concerned with the likely loss of wetlands and associated uplands habitats used by wildlife in this area.

In addition, a possible LRT extension west of the airport to the International Center has been proposed. This route would likely traverse new, undisturbed wetland areas, and again, we would be concerned with the disturbance and loss of wetlands and associated uplands habitats used by wildlife.

As you are aware, the U.S. Army Corps of Engineers requires mitigation for wetland losses. UDWR is interested in working with Wasatch Front Regional Council and Utah Transit Authority to insure development of mitigation plans which will avoid or minimize disturbances to wetlands, mitigate for unavoidable impacts, satisfying Clean Water Act (Section 404) wetland permitting requirements, and advantage opportunities to enhance wildlife habitats.

We appreciate the opportunity to comment on the proposed LRT alignment. Please feel free to contact Pam Kramer (801-476-2775), Habitat Biologist in our Northern Regional Office if we can be of further assistance.

Sincerely,

John Kimball

John Kimball
Director

cc: Lucy Jordan, U.S. Fish and Wildlife Service
Mike Schwinn, U.S. Army Corps of Engineers

H:\wp\literail\airport.002

# State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER RIGHTS

Michael O. Leavitt
Governor
Ted Stewart
Executive Director
Robert L. Morgan
State Engineer

1594 West North Temple, Suite 220
Box 146300
Salt Lake City, Utah 84114-6300
801-538-7240
801-538-7467 (Fax)

March 26, 1998

Doug Hattery
Wasatch Front Regional Council
420 West 1500 South, Suite 200
Bountiful, UT 84010

Re: LRT Alignment - General Comment

Dear Doug:

I appreciate being informed about ongoing proposals and plans. It appears this project will have minimal, if any impacts on natural streams. If possible, could natural streams be included on future maps and plans?

Thank you for looking into this. If you have any questions, please call me at 538-7375.

Sincerely,

Greg C. Mladenka
Stream Alteration Specialist

GCM/

DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF ENVIRONMENTAL RESPONSE AND REMEDIATION

Michael O. Leavitt
Governor
Dianne R. Nielson, Ph.D.
Executive Director
Kent P. Gray
Director

168 North 1950 West
P.O. Box 144840
Salt Lake City, Utah 84114-4840
(801) 536-4100
(801) 359-8853 Fax
(801) 536-4414 T.D.D.
www.deq.state.ut.us Web

ERRC-175-98

April 3, 1998

Doug Hattery
Wasatch Front Regional Council
Suite 200
420 West 1500 South
Bountiful, Utah 84010

Subject: West-East Light Rail Corridor Environmental Issues

Dear Mr. Hattery:

The Utah Division of Environmental Response and Remediation (DERR), CERCLA Branch, has received a copy of your letter dated March 24, 1998 requesting information on environmental related issues that would affect the proposed West-East Light Rail Corridor in Salt Lake County. We reviewed the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) list prepared by the U.S. Environmental Protection Agency (EPA) and stored in the State's Geographical Information System (GIS) database. The GIS map provided with this letter shows all CERCLIS sites in the vicinity of the proposed Light Rail Corridor as of January 14, 1997. In addition, the following sites are not included on the January 1997 CERCLIS database from which the attached map is drawn, but are plotted by hand on said map. These sites are currently being investigated by the DERR and have since been or will be added to the CERCLIS list soon:

South Temple Landfill
~50 South Redwood Road

Mt. Olivet Cemetary Plume
666 S. Guardsman Way

This letter identifies only currently known CERCLIS sites lying near the West-East Light Rail Corridor that were current as of January 14, 1997 and the two sites listed above. We encourage you to come to the DERR office and review our files of the sites listed above and plotted on the CERCLIS map we are providing you.

Please keep in mind sites may exist in Utah that have not been discovered or reported, and consequently are not on the CERCLIS list. In addition, a No Further Remedial Action Planned (NFRAP) finding by the U.S. EPA for a CERCLIS site means the site did not qualify for further action under the rules and regulations in place at the time of the finding. EPA's NFRAP designation does not mean hazards are absent from a site. Amendments to regulatory authority or a significant change in affected environmental targets may result in future investigation of a site which currently has a NFRAP designation.

If you require further information or have questions concerning the above sites, please feel free to contact our Government Records Management Act coordinator, Janie Ward at 536-4100 to view our files.

Sincerely,

Helen Sadik-Macdonald

Helen L. Sadik-Macdonald, C.P.G.
CERCLA Project Manager
Division of Environmental Response and Remediation

HSM/dc

Enclosure

March 27, 1998

Mr. Doug Hattery
Project Manager
Wasatch Front Regional Council
420 West 1500 South Suite 200
Bountiful UT 84010

RE: Airport to University East-West Corridor Study

Dear Doug,

After reviewing the Airport to University East-West Corridor Study study area, Salt Lake County has no additional concerns we feel need to be addressed in the Final Environmental Impact Statement. Thank you for requesting our participation in your study. Please keep us informed of future developments with this project.

Respectfully,

Andrea Pullos

Andrea Pullos
Asst. Transportation Engineer

SALT LAKE COUNTY

Salt Lake County
Public Works
Department

Engineering
Division

Randy Horiuchi
Salt Lake County
Commissioner

Lonnie L. Johnson
Director of Public Works

Neil D. Sack, P.E.
Division Director

SALT LAKE COUNTY
GOVERNMENT CENTER
2001 S. State Street
Suite N330
Salt Lake City
Utah 84190-4600
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Fax (801) 468-2566
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| Co./Dept. | Co. | |
| Phone # | Phone # | |
| Fax # 307 917 1329 | Fax # | |

ENVIRONMENTAL HEALTH DIVISION
*1954 East Fort Union Boulevard #100*
*Salt Lake City, UT 84121*
*801-944-6608 Fax*

*Division Director*
***Terry Sadler***
*801-944-6600*

April 17, 1998

Mr. Doug Hattery, Project Manager
Wasatch Front Regional Council
420 West 1500 South, Suite 200
Bountiful, Utah 84010

Dear Mr. Hattery:

In response to your letter dated March 24, 1998. The Salt Lake City-County Board of Health fully endorses any means of alternate transportation to minimize air pollution within Salt Lake County. With regards to the environmental issues we have concerning this project, only one stands out, noise pollution.

During the current and past periods of construction related to the North-South Light Rail Corridor, our office has received several complaints regarding noise pollution, primarily from residents and hotel/motel establishments. These complaints deal with the construction of the project.

Due to the massive size of the I-15 corridor construction and with the North-South light rail project underway, our office realized that it was in the best interest of the public to try to accelerate the current construction pace. By doing so, we hopefully could minimize the potential health and safety risks associated with major road closures found throughout Salt Lake County. In order for this to occur, relief from noise restriction permits were issued, in non-residentially zoned areas only, in accordance with the Salt Lake City-County Health Department Regulation #21- Noise Control.

With regards to the East-West corridor, our Department is faced with the same dilemma. Construction through the proposed route will be affecting many more and even larger major right-of-ways, probably more so than the North-South route. It is conceivable that such relief could be given for this corridor as well. This could occur from the Salt Lake International Airport to the adjoining North-South Corridor without affecting adjacent residents. However, east of this location are mixed commercial-residential and residentially zoned areas. The residents along this zone would be far more impacted than what is currently underway and easing of restrictions could be far more difficult to implement.

There are no easy answers or solutions. We will face each challenge as it presents itself. If you should have any questions or comments, please do not hesitate to contact my office at 944-6668.

Sincerely,

James F. Bennett

James F. Bennett, LEHS
Noise Control Program Manager
Environmental Health Enforcement Officer
Bureau of Sanitation and Safety

for

Kent Miner, Manager
Bureau of Sanitation and Safety
Division of Environmental Health

THE UNIVERSITY OF UTAH

March 31, 1998

Mr. Doug Hattery, Project Manger
Wasatch Front Regional Council
Suite 200, 420 West 1500 South
Bountiful, Utah 84010

Dear Mr. Hattery:

In response to your letter of March 24, 1998, regarding the possible environmental impact of the proposed rail line, I believe the crossing of Red Butte Creek would pose the only area of significant concern. However, my understanding of the most recent developments regarding this section of the East-West line indicate that it is highly unlikely that the light rail would be taken through the Park, but rather shuttle connections to the light rail utilizing existing road ways. This would, of course, have no detrimental impact, and, hopefully, would be positive in reducing traffic in the area.

Sincerely,

Charles A. Evans
Director

jn

**Research Park**

505 Wakara Way
Salt Lake City, Utah 84108
(801) 581-8133
FAX (801) 581-7195

## 7.4 Final Agency Project Correspondence

The following regulatory and resource agencies have provided final project correspondence related to the Airport to University West-East LRT project. Coordination took place with these agencies throughout the technical studies and the preparation of the FEIS document. The agency correspondence notes review and approval of FEIS sections and, where appropriate, status of permit application(s) and statements that the project has met applicable regulatory requirements. The agency letters included in this section are:

U.S. Army Corps of Engineers

U.S. Department of the Interior
Fish and Wildlife Service

Utah State Historic Preservation Office
Section 106 documentation

Utah State Department of Environmental Quality
Division of Air Quality

Utah State Department of Natural Resources
Division of Wildlife Resources

# Public Notice

US Army Corps
of Engineers

Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Public Notice Number: 19925013[illegible]
Date: January 6, 199[illegible]
Comments Due: January 21, 199[illegible]

In reply, please refer to the Public Notice Numbe[illegible]

**TO WHOM IT MAY CONCERN:**

**SUBJECT:** Application for a Department of the Army permit under authority of Section 404 of the Clean Water Act to place fill into wetlands for the construction of light rail from the Salt Lake City International Airport to the University of Utah, as shown in the attached drawings.

**APPLICANT:** Utah Transit Authority, Hal Johnson, Light Rail Transit Project Office, 221 West 2100 South, Salt Lake City, UT 84115, telephone (801) 466-4697.

**LOCATION:** The project is located in Salt Lake County, Utah in Township 1 North, Range 1 West, Sections 32-36; Township 1 South, Range 1 West, Section 1; and Township 1 South, Range 1 East, Sections 4-6.

**PURPOSE:** The East/West Light Rail Transit (LRT) Project has been proposed to meet future travel demands and connect the three largest traffic generators in the travel corridor: Salt Lake City International Airport, Salt Lake City central business district and the University of Utah. Chapter 1 of the 1997 Draft Environmental Impact Statement (DEIS) provides more detail on the purpose and need of the project.

**PROJECT DESCRIPTION:** The East/West LRT connection involves a two-directional LRT line connecting the Health Sciences Center at the University of Utah with the Salt Lake City International Airport. The LRT line would parallel 500 South, North Temple and Interstate 80 and connect to a planned hotel/commercial center at the airport. The LRT line would largely be located in the center of existing roadways and cross the Jordan River and Surplus Canal. Approximately 5.6 acres of wetlands would be filled. These wetlands occur primarily adjacent to I-80 within the right-of-way (ROW) with the exception of one wetland parcel in the vicinity of North Temple and 2400 West. See Chapter 2 and 3 of the DEIS for more detailed discussion on the project.

**AREA DESCRIPTION:** The eastern portion of the LRT line is heavily urbanized. The western section is less so. Wetlands and uplands occur within and outside of the ROW. Wetland types affected are playa/open water, wet meadow (saltgrass, wiregrass, foxtail barley, curly doc) and marsh (cattail, threesquare bulrush). These wetlands receive some migratory bird use but habitat quality is generally poor due the proximity of the roadways. See Chapter 3 of the DEIS for a more detailed description of the Affected Environment.

**ALTERNATIVES:** Three alternatives are discussed in Chapter 2 of the DEIS: Alternative A, no-build; Alternative B, Bus/HOV/TDM/TSM and the preferred alternative, Alternative C, Light Rail Transit.

Alternative B combines additional bus service, a dedicated High Occupancy Vehicle (HOV) lane with travel demand management (TDM) and traffic system management (TSM). This alternative would not require any new construction or additional lanes and, consequently, no wetland impacts.

Chapter 4 of the DEIS compares the effect of each alternative on traffic within the corridor. Tables 4-3 (page 4-6), 4-4 (page 4-7) and 4-5 (page 4-9) compare traffic peak hour levels of service (LOS) and traffic delay for Alternatives A, B, and C, respectively. The tables reveal that Alternative B does more to improve overall LOS and reduce delay on the twelve roadway segments modeled than does the preferred alternative, Alternative C.

**ADDITIONAL INFORMATION:** Known cultural resources have been identified within the corridor, however, it appears that none of the sites will be impacted by the proposed work. See Chapter 5, Environmental Consequences, of the DEIS for a complete discussion.

This activity would not affect any threatened or endangered species or their critical habitat.

The following endangered species are present in the permit area: Bald Eagle and Peregrine Falcon.

The District Engineer has made this determination based on information provided by the applicant and on the Corps' preliminary investigation.

Certification that the proposed work, if permitted, will not violate applicable water quality standards has been requested from the Utah Division of Water Quality.

Interested parties are invited to submit written comments on or before **January 21, 1999**. Any person may request, in writing, within the comment period specified in this notice that a public hearing be held to consider this application. Requests for public hearings shall state, with particularity, the reasons for holding a public hearing.

The decision whether to issue a permit will be based on an evaluation of the probable impact including cumulative impacts of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefit which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered including the cumulative effects thereof; among those are conservation, economics, aesthetics, general environmental concerns, wetlands, cultural values, fish and wildlife values, flood hazards, flood plain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, consideration of property ownership, and in general, the needs and welfare of the people.

For activities involving 404 discharges, a permit will be denied if the discharge does not comply with the Environmental Protection Agency's 404(b)(1) guidelines. Subject to the preceding sentence and any other applicable guidelines or criteria, a permit will be granted unless the District Engineer determines it would be contrary to the public interest.

The Corps of Engineers is soliciting comments from the public; Federal, state, and local agencies and officials; Indian Tribes; and other interested parties in order to consider and evaluate the impacts of this proposed activity. Any comments received will be considered by the Corps of Engineers to determine whether to issue, modify, condition or deny a permit for this proposal. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity.

If additional information is required, please contact Mr. Hal Johnson, Utah Transit Authority, Light Rail Transit Project Office, 221 West, 2100 South, telephone (801) 466-4697 or Mr. Michael Schwinn, 1403 South 600 West, Suite A, Bountiful, UT, 84010, telephone (801)295-8380; email mschwinn@spk.usace.army.mil

Michael J. Walsh
Lieutenant Colonel (P),
Corps of Engineers
District Engineer

Enclosures: Drawings (4); Maps (8)

United States Department of the Interior
FISH AND WILDLIFE SERVICE
UTAH FIELD OFFICE
LINCOLN PLAZA
145 EAST 1300 SOUTH, SUITE 404
SALT LAKE CITY, UTAH 84115

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DeLeuw Cather &

In Reply Refer To
(CO/KS/NE/UT)

October 27, 1998

Ms. Cindy Johnson
Natural Resources Consulting
1135 East Center
Logan, Utah 84321

Subject: Sections of Two Chapters For Inclusion in the Final Environmental Impact Statement for the West-East Light Rail Transit Project, Utah Transit Authority and Wasatch Front Regional Council

Dear Ms. Johnson:

The U.S. Fish and Wildlife Service (Service) has reviewed the subject material as requested in your letter dated October 12, 1998. The only comment that we have to offer pertains to the fifth paragraph, fifth sentence, page 3-30, "These wetland areas, however, appear to be subject to fluctuating water levels which reduces their value for wildlife."

The Service believes it is primarily a human disturbance, such as traffic and ongoing construction in the general area, that reduces their value. We acknowledge that some species of wildlife adapt to these disturbances more readily than others. However, fluctuating water levels of these temporary and seasonal wetlands do not reduce their value. When water levels are evident in the spring and after thunder showers, these wetlands provide feeding and resting habitat for several species of shore and wading birds that feed on the various insect life associated with them. Further, the alternating wet and dry periods help maintain their unique character as playa wetlands with a specific assemblage of vegetation and invertebrates.

Aside of this concern, we believe the two sections submitted for our review, Section 3.6.2-Wildlife and Section 3.6.3-Threatened and Endangered Species, address the issues and therefore, have no further comments to offer.

Thank you for the opportunity to review and comment.

Sincerely,

for Reed E. Harris
Utah Field Supervisor

Michael O. Leavitt
Governor
Max J. Evans
Director

# State of Utah

Department of Community and Economic Development
Division of State History
Utah State Historical Society

300 Rio Grande
Salt Lake City, Utah 84101-1182
(801) 533-3500 FAX: 533-3503 TDD: 533-3502
cehistry.ushs@email.state.ut.us

UTAH STATE HISTORICAL SOCIETY
SINCE 1897

October 15, 1998

Jan Striefel, ASLA, AICP
Principal and President
Landmark Design, Inc.
2834 Highland Drive
Salt Lake City UT 84106

RE: Airport to University West-East Transportation Corridor

In Reply Please Refer to Case No. 97-1092

Dear Jan Striefel:

The Utah State Historic Preservation Office received your letter on the above referenced project on October 6, 1998. After consideration of the consultation request letter, the Utah Preservation Office believes that all requirements for this stage of the project have meant the requirements of 106 Consultation as outlined by §36CFR 800.

This information is provided on request to assist with Section 106 responsibilities as specified in §36CFR800. If you have questions, please contact me at (801) 533-3555. My email address is: jdykman@state.ut.us

As ever,

James L. Dykman
Compliance Archaeologist

JLD:97-1092 OFR

F:\CULTURAL\JIM\97-1092.wpd

## 36 CRF Part 800

## "Protection Of Historic Properties"

## Section 106 Review

## For

## Airport to University West-East Transportation Corridor

### UNDERTAKING

Based upon coordination with pubic and government agencies, combined with evaluation of technical considerations, Wasatch Front Regional Council has identified a light rail transit (LRT) system as the preferred alternative to serve the Airport to University West-East Transportation Corridor of Salt Lake City, Utah.

The 10.9 mile West-East Corridor will be constructed from the Salt Lake City International Airport (SLCIA) through the Central Business District (CBD) of Salt Lake City to the University of Utah Health Sciences Center. The western terminus will connect with the planned SLCIA transportation center, one of the improvements scheduled to be constructed as part of the SLCIA Master Plan Update. The West-East LRT alignment crosses the airport property on an elevated guideway, then transitions to an at-grade alignment just north of the proposed airport hotel LRT station. It then departs the airport property at the existing westbound I-80 access roadway to run along I-80 south of the airport golf course to 2500 West. From 2500 West, the alignment heads north about two block to North Temple Streets. Between 2500 West and 2400 West, south of North Temple Street, maintenance, storage and other transit-related facilities are planned.

The West-East LRT then runs down the middle of North Temple Street to the east until 400 West where it turns south. The LFT alignment runs down the middle of 400 West to 400 South where it travels east through downtown. On 400 South, between 400 West and 200 East, the LRT system will be a single track alignment on each side of the street. East bound LRT vehicles will be located on the south side of the street and westbound LRT vehicles will be on the north side of the street. East of 200 East, the LRT alignment follows the roadway over to 500 South as it goes up a steep hill. At University Avenue (about one block east of 1300 East), the LRT alignment enters the campus of the University of Utah and runs along the west side of the Rice-Eccles Stadium parking lot to 400 South. The LRT alignment then turns east and follows South Campus Drive along the north side of the street, past the stadium and Huntsman Center to Wasatch Boulevard. The LRT alignment then runs along the east side of Wasatch Boulevard and Medical Drive to the north until the east terminus at the University's Health Sciences Center. Sixteen LRT stations are planned throughout the route plus two end terminal stations. Also, two future LRT stations are proposed: one station at 2400 West/North Temple Street and one on 500 South between 1100 and 1200 East.

It will interface with the existing north/south LRT line at 400 South and Main Street and at South Temple and 400 West where a passenger transfer between lines will be possible. A park and ride lot is planned along North Temple Street across from the Utah State Fairpark. The State Fairpark is currently developing site plans for the area. When the development occurs, a shared parking structure will be incorporated into the site design to serve as a parking facility for both Fairpark and LRT patrons. A new LRT bridge structure will be construct just sough of the existing viaduct between 600 West and 400 West. The West-East LRT stations are summarized below beginning at the Airport:

SLCIA terminal (transportation center)
Airport hotel (after construction)
North temple at 2400 West (proposed future station)
North Temple and Winifred Street
North Temple and Cornell (east of Redwood Road)
North Temple and State Fairpark
North Temple and 800 West
400 West between South Temple Street and 100 South
400 West between 300 South and 400 South
400 South at 200 West
400 South east of Main Street
400 South at 200 East
400 South just east of 600 East
400 South between 800 East and 900 East
500 South between 1100 East and 1200 East (proposed future station)
South Campus Drive at Rice-Eccles Stadium
South Campus Drive at Guardsman Way/Central Campus Drive
South Campus Drive at Huntsman Center
Health Sciences Center terminal

400 West Street will include the LRT system in the middle of the street and two through-travel lanes in each direction; South Campus Drive will include LRT on the north side of the street and one through-travel lane in each direction; and on Wasatch Boulevard and Medical Drive the east side of the LRT right-of-way will coincide with the existing curb on the east side of these two streets. No right-of-way will be needed for West-East LRT construction from Fort Douglas and Pioneer Park.

The West-East LRT project will fulfill the following objectives improve transit reliability between major destination with the corridor, reduce traffic congestion, improve air quality, interface with the existing and planned regional transit systems, assure minimal impacts on the natural and manmade environment, support development of a multi-modal transportation system that is convenient, accessible, and flexible enough to increase capacity, and connect with service extended to new areas in the future

## AREAS OF POTENTIAL IMPACT

### Historic Sites and Structures

Salt Lake City has numerous historic and cultural resources that fulfill the requirements for listing on the National Register of Historic Places and on the Salt Lake City Register of Historic Places This Section 106 review takes into account those properties that are listed on the National and City Registers Those structures and sites along the preferred alignment that are potentially impacted have been identified and evaluated

### Prehistoric and Historic Archaeological Resources

Salt Lake City also has the potential for prehistoric and historic archaeological resources to be impacted, particularly during excavation and construction within the transit corridor While it is not possible to identify exact locations where prehistoric and historic archaeological resources currently exist, it is possible to anticipate encountering such resources during excavation and construction Consequently, it is necessary that there be a procedure in place for reporting encounters, requesting an official response from the State Historic Preservation Officer (SHPO), and monitoring the project

## IDENTIFICATION

### Historic Structures and Sites

Historic and cultural resources were investigated using existing information available from the Utah Division of State History, the State Historic Preservation Officer, and the Salt Lake City Historic Preservation Officer Neighborhood planning documents were also reviewed

There are six historic structures and sites located along the corridor (See map for locations.)

- Utah State Fairpark located at 1000 West North Temple
- Union Pacific Railroad Depot located at 400 West and South Temple
- Pioneer Park/Old Pioneer Fort Site located at 300-400 South and 300-400 West

- Salt Lake City and County Building/Washington Square located at 451 South State Street.
- Tenth Ward Square at 400 South and 800 East
- Carlson Hall on the University of Utah campus on corner of South Campus Drive and University Street

In each case the proposed LRT alignment passes on the street directly in front of these structures. Except for 400 South Street adjacent to Pioneer Park, the LRT rail line is located in the center of the streets and includes track, a station platform, overhead catenary poles and wires (power supply), and paving. The proposed alignment adjacent to these structures is designed so that there is no construction activity outside of the existing curb and gutter on either side of the roadway, therefore there will be no direct interface with the structures.

**Prehistoric and Historic Archaeological Resources**

There are no known prehistoric or historic archaeological resources within the right-of-way of the proposed LRT alignment, and at this time it is impossible to determine where they may be encountered. However, there is the potential for encountering both prehistoric and historic archaeological resources during excavation and construction. Recent encounters along South Temple Street for construction of the north/south LRT line, and previous discoveries in the Pioneer Park area suggest that when construction activity takes place in these areas, there is the strong potential that historic archaeological resources will be discovered. (See map for the general vicinity of previous discoveries.)

EFFECTS

**Historic Structures and Sites**

Based on the location of the historic structures and sites, which is outside of the existing roadway right-of-way, and the location of the LRT track which is generally in the center of the existing roadway right-of-way (except for the block on 400 South at Pioneer Park), it has been determined that there is "No Effect" on historic structures or sites due to the proposed LRT alignment.

**Prehistoric and Historic Archaeological Resources**

Due to the inability to predict effects on prehistoric and historic archaeological resources which are unknown at this time, it is determined that there is "No Adverse Effect" on prehistoric or historic archaeological resources due to the proposed LRT alignment. There is some potential for discovery of prehistoric and historic archaeological resources in the alignment due to previous discoveries along portions of the proposed alignment, consequently, a procedure to establish protocol in such an event follows.

**Recommended Protocol In The Event Of A Prehistoric or Historic Archaeological Discovery For Reporting and Monitoring**

If during construction of the project prehistoric or historic archaeological remains are discovered, the Agency Official shall notify the State Historic Preservation Office (SHPO) at the earliest possible time with details of the discovery. The SHPO shall provide interim comments to the Agency Official within 48 hours of the request and final comments to the Agency Official within 30 days of the request. Procedures outlined in 36CRF 800.11 will be followed by the SHPO and Agency Official in developing a response to the discovery. In addition, an archaeological monitoring contractor will be employed during construction. The frequency of and location of monitoring will be developed in consultation with the SHPO.

## CONCLUSIONS

Regarding Historic Structures and Sites (listed on the National Register of Historic Places), it is determined that there is "No Effect."

Regarding Prehistoric and Historic Archaeological Resources (unknown artifacts and remains which may be underground), it is determined that there is "No Adverse Effect."

DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY

Michael O. Leavitt
Governor
Dianne R. Nielson, Ph.D.
Executive Director
Ursula K. Trueman
Director

150 North 1950 West
P.O. Box 144820
Salt Lake City, Utah 84114-4820
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(801) 536-4099 Fax
(801) 536-4414 T.D.D.

DAQT-003-99

January 13, 1999

Doug Hattery, Transportation Engineer
Wasatch Front Regional Council
420 West 1500 South, Suite 200
Bountiful, Utah 84010

Dear Mr. Hattery:

The Utah Division of Air Quality (UDAQ) has completed its review of the Carbon Monoxide (CO) Air Quality Impact Analysis for the West/East Light Rail project in Salt Lake City. After a thorough review, the Division has concluded that the computer dispersion analysis provides a reasonable estimation of air quality impacts from the proposed project.

The analysis indicates that the implementation of the West/East Light Rail project would not result in a violation of the National Ambient Air Quality Standard (NAAQS) for CO at or near the affected intersections. However, this statement is only true if the project is constructed using the intersection configurations and traffic flow projections represented in the dispersion models. In the event that any change in the current project's design results in changes to the light rail route, or intersection configuration and/or traffic signal timing at any of the six major intersections reviewed in the analysis, possible violations of the NAAQS for CO may occur. It is, therefore, the recommendation of the UDAQ that should any such design changes occur in the future, the dispersion modeling analysis should be re-executed to reflect the changes, and the results of the analysis be submitted to the UDAQ for review.

If you have any questions, you may contact Tom Orth of my staff at (801) 536-4005.

Sincerely,

Ursula K. Trueman

Ursula K. Trueman, Director

UKT/TO/gb

cc: Rick Sprott, Manager
Planning Branch

RECEIVEr

DEC - 4 1998

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State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WILDLIFE RESOURCES

Michael O. Leavitt
Governor

John Kimball
Division Director

1594 West North Temple, Suite 2110
PO Box 146301
Salt Lake City, Utah 84114-6301
801-538-4700
801-538-4709 (Fax)
801-538-7458 (TTY)


October 29, 1998

Ms. Cindy Johnson
Natural Resources Consulting
135 East Center
Logan, UT 84321

Dear Ms. Johnson:

The Utah Division of Wildlife Resources has reviewed the sections of the Final Environmental Impact Statement for the proposed West-East Light Rail Transit Project. Overall, we believe the document provides adequate information in its current form. We do have one comment which concerns wording contained in Section 3.6.2., paragraph 7. As currently worded, the paragraph suggests that fluctuating water levels reduce the value of wetlands for wildlife. Fluctuating water levels actually are important to the wildlife value of some wetlands because salts which are deposited on or near the surface during drying phases maintain the vegetation in a state that allows high production of insects important as a food source. We recommend a wording change to indicate that fluctuating water levels do no necessarily decrease value for wildlife.

Thank you for the opportunity to review and comment on this Final Environmental Impact Statement. Please contact Jaye Melcher in our Salt Lake City office (801-538-4864) if you have any questions.

Sincerely,

John Kimball

John Kimball
Director

# SECTION 8
# LIST OF PREPARERS

The following persons contributed to the preparation of this FEIS.

## Wasatch Front Regional Council

**Mick Crandall** is a transportation engineer with over 25 years experience in transportation planning and travel demand modeling. He oversaw WFRC's travel model and the modeling analysis for transportation impacts.

**Scott Festin**, M.A., is a transportation planner with three years experience. He assisted in assembling computerized demographic information, and with ridership modeling.

**Scott Hagen**, M.S., has worked in regional and urban planning for the past two years. Prior to that, he was involved with the business and technology sectors for ten years. He was primarily responsible for FEIS content review and community involvement facilitation.

**Doug Hattery** is a transportation engineer with 16 years of experience in transportation planning. As WFRC project manager, he oversaw the study process and chaired the Steering Committee.

## Utah Transit Authority

**Michael Allegra**, M.S., is a civil engineer with 20 years experience in analyzing community needs in public transit, planning, design, development, and construction of light rail transit systems and bus systems. He served as the UTA project manager, and was responsible for overseeing all aspects of the FEIS.

**Stan DeYoung**, M.P.A., M.B.A., is a financial analyst with 15 years experience in financial analysis, budgeting, and accounting. He prepared the financial forecasting model for cash flow, and assisted in preparation of the financial section.

**Steven W. Greene,** M.S., P.E., is a civil engineer with 7 years experience in transportation projects including highway and roadway design, site design, and light rail transit. He was responsible for providing review and oversight on the engineering portions of the FEIS.

**Hal Johnson**, M.E.R.P., is a transit planner with five years experience in planning and implementation of light rail systems. He assisted with agency coordination and FEIS review.

**Ken Montigue**, B.S., C.P.A., is a financial and accounting specialist with 31 years experience in finance and administration for public transit systems. He assisted in preparation of the financial analysis.

**Randy Park**, M.S., is a transit planner with 22 years experience in management of strategic policy development, grants and programming, infrastructure development, and long range planning. He oversaw bus/rail interface planning.

## Parsons Transportation Group

**Robert J. Clayton**, P.E., is a transportation engineer with five years experience in roadway design, traffic engineering, and transportation planning. He assisted in preparing the utility audit, assessing utility impacts, and traffic and transportation impact analysis.

**Sara Colosimo**, P.E., is a transportation engineer with 13 years experience in transportation planning, traffic engineering, and highway design. Special expertise in Intelligent Transportation Systems, urban transportation planning, systems integration, traffic/light rail transit signal timing, signing, and traffic control. Served as a project engineer for the traffic analysis.

**Ron Deverman**, M.S., is an environmental engineer and planner with over 16 years experience in managing preliminary engineering and NEPA EIS studies for complex transportation projects, including major roadway and transit corridors. He was responsible for overall management of the FEIS technical studies and document preparation.

**Scott Hoftiezer**, B.S., is a civil engineer with five years experience in traffic impact analysis, signal and interstate signage design. He prepared the transportation impacts analysis, including traffic analysis.

**Ralph E. Jackson** is a transportation engineer with over 34 years of public agency and private sector consulting experience in transportation planning, systems analysis, facility design, rapid transit technology assessment, bus operations planning, and construction management. He served as the PTG project manager on this study, and oversaw all project operations.

**Judy L. McCarthy** is a senior CADD specialist and graphic designer with 13 years experience in environmental, civil, architectural, structural, electrical, and mechanical design projects. She prepared all FEIS graphics.

**Rick Phillips** is an architect and urban planner with over 20 years of experience in the development of intermodal transportation, including light rail transit and bicycle and pedestrian systems. He was responsible for assessing the impact of LRT on pedestrian and bicycle circulation and developing mitigation measures.

**Edward R. Stolloff** is a senior transportation planner with 18 years of experience in design and preliminary engineering studies for major highway projects, level of service studies for arterials and transit routes, transportation demand management studies, complex traffic impact studies, and numerous environmental impact studies. He assisted with the preparation of the transportation section of the FEIS.

**Doug Zang** has over eight years experience working on NEPA studies for a variety of transportation projects. His expertise includes air quality analysis, biological resources studies and EIS preparation. He was responsible for preparation of the air quality, and transportation analyses of the FEIS, as well as editorial and content review.

## Harland Bartholomew & Associates, Inc.

**Mark Gander**, M.S., A.I.C.P., is a planner with ten years of experience in growth management planning, land use and transportation planning, economics, socio-economics, transit-oriented development, and preparation of NEPA EIS documents.

## Parsons Engineering Science

**Joseph M. DeStefano II**, B.A., C.P.P., is a air quality specialist with six years consulting experience in providing air quality impact analysis and environmental document preparation services. He was responsible for coordination of data collection activities, preparation of modeling protocol, emission estimation, dispersion modeling, and analysis of modeling results.

**Robert Graves**, M.S., P.G., is a senior geologist with over 11 years of experience conducting hydrogeologic investigation at leaking underground storage tanks, and hazardous waste sites. He performed the potential contaminant sources inventory, and conducted the Phase I and II site assessments.

**Dr. Marlund Hale**, Ph.D., P.E., I.N.C.E., is a noise and vibration specialist with 28 years experience in environmental and industrial noise and vibration control engineering. He was responsible for supervising the noise and vibration baseline analysis and impact evaluation.

**Thanh T. Luc** is a senior engineer with extensive experience in analyzing noise impacts on surrounding communities and designing noise abatement measures. He assisted in the noise and vibration baseline analysis and impact evaluation.

**Dr. Krishna Nand**, Ph.D., Q.E.P., has over 32 years of experience in providing air quality consulting services including air quality impact assessments, air emissions estimation, air dispersion modeling, and multipathway health risk assessments. He was responsible for technical oversight and quality assurance review of the air quality analysis.

**Heidi Rous**, B.S., is a senior air quality specialist with eight years consulting experience in conducting air quality modeling and impact analysis. She was responsible for oversight of air quality pollution emission modeling (MOBILES).

**John VonLunen**, B.S., is an environmental geologist specializing in archive inquiries and field investigations. He assisted in the potential contaminant sources inventory.

**Gene Wright**, B.S., P.G., C.C., has over 24 years of experience in conducting geologic and hydrogeologic investigations, contaminant characterizations, and remediation at petroleum and hazardous sites. He was responsible for the intercompany coordination of the Phase I and II site assessments, noise and vibration study, and the air quality study.

## Wikstrom Economic and Planning

**Patricia Callahan**, M.B.A., is a financial analyst with 17 years of experience in banking, health care, and transportation. She was responsible for the socioeconomic and demographic baseline analysis and evaluation of impacts.

**Karen Wikstrom**, M.S., A.I.C.P., is an economic planner with 19 years of experience in urban economics, real estate and finance. She assisted in the socioeconomic analysis and evaluation of impacts.

## Landmark Design

**Jan Streifel**, A.S.L.A., A.I.C.P., is a landscape architect and planner with 21 years experience. She was responsible for the baseline analysis and evaluation of impacts to land use, visual and aesthetics, historic and cultural resources, and parks and open spaces.

## Natural Resources Consulting

**Cynthia Johnson**, M.S., is a plant ecologist with 14 years of experience and expertise in the technology of upland and wetland plant communities in the Intermountain and Rocky Mountain West. Certified by the Utah Office of the U.S. Army Corps of Engineers to delineate wetlands and by the U.S. Fish and Wildlife Service to perform Habitat Evaluation Procedures analysis. She was responsible for the wetland delineation, and the wetland and natural resources impact analyses.

**Ronald Ryel**, M.S., Ph.D., is a wildlife and system ecologist with 16 years of experience with the wildlife of Cache Valley and the intermountain West. He was responsible for the wildlife and biological resources studies and appendices to the FEIS.

## Coley/Forrest

**Jean Townsend** is a consulting economist with 26 years experience specializing in public finance, economic development, real estate and financial feasibility analysis. She assisted in the financial analysis.

## Bearwest Co.

**Ralph Becker**, M.S., J.D. has spent 20 years as an attorney, and 26 years in planning and policy analysis, and has 13 years of experience in NEPA compliance. He assisted in the public involvement process and working group meetings.

**Emily Charles** is a public process facilitator with 19 years experience in public policy, planning, and public involvement. She assisted in implementing the public involvement process.

## Transvision, LLC.

**Vicki D. Colton**, B.S., is an environmental communication specialist with eight years experience in planning, NEPA documentation, study coordination, and public involvement. She was responsible for writing and editing the FEIS, and coordinating and facilitating public involvement activities and working group meetings.

## Sharon Greene and Associates

**Sharon Green**, M.C.P., is a specialist with 25 year of experience in transportation finance, multimodal transportation system evaluation and implementation, joint development, and strategic planning. She conducted the financial analysis for the FEIS.

## Agency Technical Support

**James L. Dykman**, the Compliance Archaeologist for Utah State Historical Society, provided Section 106 compliance review for the project.

# LIST OF APPENDICES

# APPENDIX A
# BUSWAY ANALYSIS REPORT

Wasatch Front Regional Council
Utah Transit Authority

# BUSWAY ANALYSIS


PARSONS
TRANSPORTATION
GROUP

January 1998

# TABLE OF CONTENTS

## TABLE OF CONTENTS (CONTINUED)

## SECTION 1 - INTRODUCTION

In July 1997, a Major Investment Study/Draft Environmental Impact Statement (MIS/DEIS) was completed for the West/East Transportation Corridor in Salt Lake City, Utah. As documented in the MIS/DEIS, light rail transit (LRT) was officially adopted and approved by the community and participating agencies as the locally preferred alternative (LPA) for the West/East Corridor. Recently, the Federal Transit Administration (FTA) requested that consideration be given to implementing a busway as an interim step to constructing the ultimate LRT system in the corridor. Under this strategy, a busway would be constructed and operated for a period of time, after which the busway would be converted to an LRT system. The purpose of this report is to provide information regarding the potential implications on cost and implementation schedule if a busway were to be constructed as an interim step to eventually constructing the LRT system that has been adopted as the LPA for the corridor. Evaluation of transit options is discussed in Section 6 and the conclusion of the study is presented in Section 7.

## SECTION 2 - BACKGROUND

### Need for Transportation Improvements

Recent population growth forecasts show that by the year 2015 the Salt Lake County area will reach a population of over 1.2 million people and the Wasatch Front region will exceed 2 million. Employment in the county is forecasted to rise from 474,096 jobs to 638,720 jobs by 2015. About 60 percent of Salt Lake City's retail activity occurs in the West/East transportation corridor. Moreover, travel in the Salt Lake area is projected to grow significantly over the next twenty years. Total trips will increase by 57 percent, from 7.25 million trips per day to 11.4 million in 2015. Vehicle miles traveled will grow even faster, from current levels of 21 million to 32 million, an increase of 62 percent. These factors, population and employment growth, dispersed land use development, and increased trips, are already contributing to significant delays and lack of mobility.

### Transit Alternatives for the I-15 Corridor

The transportation system selected as the LPA for the I-15/State Street corridor includes reconstruction of the freeway and construction of an LRT system. Both of these elements are currently under construction. As part of the process that was undertaken in 1994 to select a transit technology for the I-15/State Street Corridor, the Salt Lake Council of Governments (COG) went through a six-month program of evaluation and community dialogue regarding the appropriate transit technology for the corridor. A particular emphasis of this deliberation was focused on whether or not a busway would be more appropriate for the corridor than LRT. Following a series of transit technology hearings in September of 1994, the Salt Lake Valley and COG were able to form a near consensus on a specific preferred alternative. The "preferred alternative" adopted by a majority of the COG members was to retain the language in the Wasatch Front Regional Council's (WFRC) Long Range Transportation Plan calling for, in part, the "planning and development of a medium-capacity fixed guideway transit system along the Union Pacific rail corridor from Sandy to Salt Lake City". As recorded in the documentation of that decision, "fixed guideway transit system" was understood to be a reference to LRT. By virtue of this decision, the community clearly established their preference for LRT rather than a busway for the I-15/State Street Corridor. This decision therefore established LRT as the transit technology for the first segment of the future regional fixed guideway transit system.

As further confirmation of the decision for LRT in the I-15/State Street Corridor, the Utah Transit Authority (UTA) undertook a detailed engineering study of the feasibility and capital costs of a busway alternative. This study was undertaken in the Spring of 1995. A report was published in March of 1995 entitled "Salt Lake Bus/Rail Project - I-15/State Street Corridor - Busway Alternative". The busway was evaluated to serve either as a permanent transit alternative or as an interim facility prior to the development of fixed-guideway rail transit along the same alignment. The busway alternative for this study consisted primarily of a two-lane, two-way roadway reserved for exclusive use by UTA buses, with multiple access points and on-line stations. By providing a dedicated roadway for buses, this type of facility would increase the speed and reliability of bus transit service in the corridor. The conceptual design of this busway alternative was based on a local/express operating scenario, with busway service provided by a combination of local-stop (each station along the route) and non-stop (express bypass of local stations) buses. Grade separated crossings would be provided at existing locations along the I-15 corridor with a few key exceptions for major arterials or state routes. The impact of intersections would be minimized by the use of two-way stop control at low-volume cross street locations and preemptive traffic signal systems at major intersections. This alternative was evaluated for demand capacity, design and operational characteristics, and costs (capital, operations, and maintenance), among other factors.

The feasibility study produced the following cost comparison:

| | |
|---|---|
| LRT guideway capital cost | $86.6 million |
| Busway capital cost | $103.7 million |

Because the busway capital cost was estimated to be higher than the LRT guideway capital cost, the previous decision was confirmed to reject the busway alternative as either the interim or the final technology selection for the I-15/State Street Corridor.

**WFRC Long-Range Transit Plan**

In December of 1996, WFRC completed a year-long study undertaken to establish a long-range transit plan for the region. In the course of this study, several corridors were evaluated regarding their potential for implementation of high-capacity transit service. The following corridors were identified as having sufficient travel demand to warrant further consideration of high-capacity transit:

University-Airport East/West Corridor
West Valley Corridor
Sandy City Corridor
West Jordan Corridor
Draper Extension
Regional Service South to Utah County
Regional Service North to Davis and Weber Counties

Estimates of capital cost and potential transit ridership were made for each of these corridors. Most importantly, the West/East Corridor from the University of Utah, through downtown to the Salt Lake City International Airport, was identified as having the highest potential for implementation of high capacity transit. WFRC has identified the West/East Corridor as a vitally important corridor that will further expand the regional transportation network beyond the north/south LRT line already under construction. This finding was the basis for undertaking the MIS/DEIS now completed for that corridor. The Light Rail Alignment for the LPA in the West/East Corridor is illustrated in Figure 2-1.

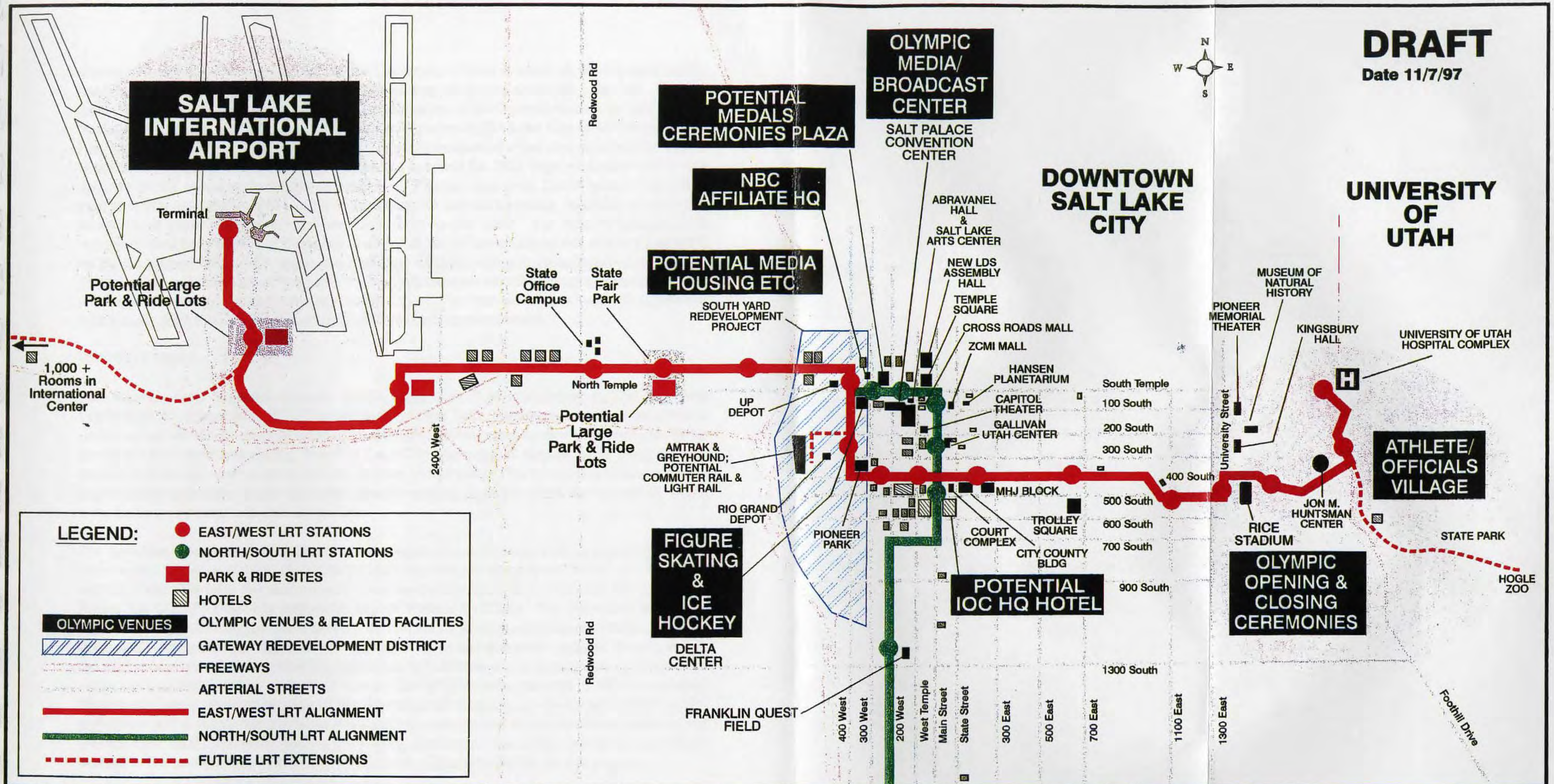
## SECTION 3 - STRATEGY TO MEET FUTURE TRAVEL DEMAND

### Integrated Transportation Planning

Major transit investments in the West/East Corridor have broad implications for upgrading the entire regional transportation system because so many daily trips go to and through this corridor. Through Salt Lake County, I-15 is currently being reconstructed to add more travel lanes, including a high occupancy vehicle (HOV) lane. In addition, as part of the need for improving capacity in the I-15/State Street corridor, UTA is constructing a light rail line from Sandy (13 miles south) to downtown Salt Lake City. This line will not only carry downtown commuters, but also passengers traveling to the airport and to the University. The West/East Corridor therefore serves as a distributor corridor to both north-south transit and highway systems. Three major trip generators, including Salt Lake City International Airport, the central business district (CBD) and the University of Utah, generate large volumes of traffic and have created a pressing need to implement transportation improvements to link these entities to the regional transportation system. Residential neighborhoods located between these generators, which are now affected by local and regional traffic, could benefit from these corridor improvements.

### Year 2002 Winter Olympic Games

In February 2002, Salt Lake City will host the Winter Olympic Games. Major Olympic facilities (event stadiums, arenas and participant housing) and much of the area's lodging are located in the West/East corridor. For example, the Olympic Stadium, (capacity 50,000) which will hold the opening and closing ceremonies, is located at the university and the Delta Center (capacity 15,000) which will hold the figure skating and ice hockey competitions, is located downtown. Salt Lake City International Airport (SLCIA) is where most of those coming to Salt Lake City for the Olympic




# SALT LAKE AIRPORT TO UNIVERSITY OF UTAH LIGHT RAIL ALIGNMENT

Figure 2-1

Games will arrive and depart. Moreover, the University of Utah is where all the Olympic teams, coaches and staff will reside in an Olympic village setting while they are in Salt Lake City. The Salt Lake City CBD is already growing rapidly in anticipation of the Olympic Games, as well as from increased convention and tourist interest due to the selection of Salt Lake City as an Olympic host. For example, the Media Center, the central broadcasting location of event coverage, will be located in the CBD. The large number of people expected to attend the 2002 Olympic Games will attend multiple events at numerous locations every day. This includes over 25,000 persons attending awards ceremonies scheduled to be held in the downtown area each evening. In addition, there will be increased commercial, retail and service activity in the CBD. For security reasons, it is recognized that competitors, officials and coaches for the Olympic Games will not be transported on public transportation. However, the challenge of transporting large volumes of spectators, general public and media, in addition to providing safe transportation for Olympic participants, will require an efficient and responsive transportation system. For three weeks, Salt Lake will experience significantly high travel demand associated with this international event.

**MIS/DEIS Study**

The Wasatch Front Regional Council (WFRC), the Utah Transit Authority (UTA), the Utah Department of Transportation (UDOT), and the City of Salt Lake, in cooperation with other agencies carried out an MIS/DEIS study in order to identify appropriate transportation improvements along the West/East Corridor extending from Salt Lake City International Airport (to the west) through downtown Salt Lake City to the University of Utah (to the east). This Corridor connects the three largest traffic generators in the Salt Lake area: the airport, downtown, and the university, which includes major hospital and medical facilities.

The West/East Transportation Corridor Study was undertaken to develop, analyze, and select the best ways to meet future travel demands within the study corridor. To this purpose, WFRC, UTA, UDOT and Salt Lake City have prepared a major investment study (MIS) and a National Environmental Policy Act (NEPA) Draft Environmental Impact Statement (DEIS). The West/East MIS/DEIS identifies the need for future transportation investments and proposes recommendations to meet those needs through the development and evaluation of several alternative actions. Simply stated, the MIS process developed alternative approaches to transportation improvements in the corridor on the basis of feasibility and cost-effectiveness. The DEIS process, required by NEPA, evaluates the potential environmental impacts of the developed alternatives. A 45-day MIS/DEIS review period was held to ensure that the public and regulatory agencies had an opportunity to comment and provide input on the document and the study being conducted. The public and agency comments will aid in the development of the FEIS and Record of Decision (ROD) for this project.

**MIS/DEIS Alternatives**

The three alternatives evaluated in the MIS/DEIS are: (1) the No-Build Alternative, under which no action except already committed transportation improvements will occur; (2) the Bus/HOV Alternative, which includes bus and high occupancy vehicle lane improvements combined with

Transportation System Management (TSM) and Transportation Demand Management (TDM) strategies; and (3) the LRT Alternative, which includes light rail transit combined with TSM and TDM strategies. These three alternatives were evaluated based upon transportation impacts, socio-economic and environmental impacts, benefits, and costs. The LRT Alternative was selected as the locally preferred alternative (LPA) because LRT combined with TSM and TDM, will interface well with the regional transit system; improve mobility and transit reliability between major destinations within the corridor; help reduce traffic congestion; improve air quality; promote existing land use plans and policies; and in the long term, will be more cost effective and ensure the greatest operating system efficiency.

The Bus/HOV Alternative that is addressed in the MIS/DEIS focuses on expanded bus service in the corridor, combined with HOV lanes, Intelligent Transportation Systems (ITS) technologies, and TSM and TDM strategies. Bus service would be expanded to offer limited stop bus service throughout the corridor, including increased service to SLCIA and the University of Utah, as well as increased frequencies of conventional buses on existing routes during the AM and PM peak travel hours. Even though a range of bus alternatives was considered for the MIS/DEIS, the Bus/HOV Alternative as stated was the one that was carried through the MIS/DEIS environmental analysis since it represented a reasonable bus transit alternative to represent the TSM option required on the MIS process.

**Curitiba Busway System**

An advanced busway system has been developed in Curitiba, Brazil that is now noted by the FTA as a model transit system that should be considered for some U.S. cities. The system implemented in Curitiba is very similar to LRT in that it attempts to provide fast, reliable transit service. The principle difference is the use of buses versus LRT technology in major transportation corridors. Curitiba planners anticipate the need for upgrade to a rail transit system in high passenger volume corridors at some point in time in the future.

The Curitiba busway system uses a variety of local, interdistrict, feeder, direct, and articulated express buses that serve specific purposes within the Curitiba geographic area. The busway system was designed as a single entity rather than as disparate components of buses, stops, and roads. It was a planned development over time and therefore avoided the need to be retrofitted into an existing developed urban community and transit system. It is an integrated transportation network that covers the whole city and provides passengers numerous route and itinerary options. Concentric circles of local bus lines connect to five radial lines that go outward from the center of the city in a spider web pattern. On the radial lines, triple compartment buses in their own dedicated travel lanes carry up to 270 passengers each. These and other direct line buses can go as fast as subway cars. The buses stop at plexiglass tube stations. Passengers pay their fares, enter through one end of the tube and exit from the other end. This system eliminates paying on board, and allows faster loading and unloading, less idling, less air pollution, and a sheltered place for waiting passengers.

**Alternative Transit Implementation Strategies**

In recent correspondence and communication with FTA, it was suggested that UTA and WFRC consider implementing a Curitiba-type bus rapid transit (BRT) system as an interim step prior to constructing the LRT system identified as the LPA for the corridor. Information from the Curitiba system indicated that busways were constructed at less cost than the likely LRT capital cost. FTA therefore wanted to explore whether or not it would be appropriate to first construct a busway in the corridor and then, at some future date, convert the busway to LRT. Construction of a busway as an interim corridor transit system would involve two phases. Phase I of implementation would be to construct the busway. Phase II would be to convert the busway to an LRT configuration. The analysis and evaluation of this two-phase strategy are presented in the following sections of this report.

## SECTION 4 - BUSWAY AND LRT ALTERNATIVES

**Equivalent Level of Transit Capacity**

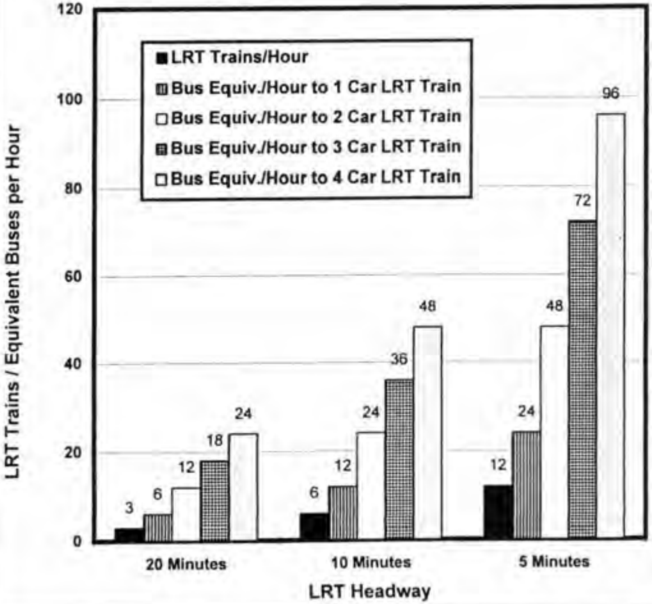
For the purposes of this analysis, it was important to develop busway and LRT alternatives that would provide an equivalent level of passenger capacity for the West/East Transportation Corridor. The bus equivalent of an LRT car is established by calculating the number of buses that would be needed to carry the same number of passengers compared with an LRT vehicle at a common level of density for standing passengers. A low-floored articulated bus can hold 80 people, including standees, while a high-floored LRT vehicle holds 160 people including standees. This 2:1 ratio was used to estimate the number of buses required to achieve equivalent transit capacity compared to LRT.

Transit system capacity is not only a function of vehicle capacity, but is also dependent on the number of units operated over a given period of time. In the transit industry, this is defined in terms of "headway", which is the number of minutes between the arrival time of transit vehicles. For example, in a system where vehicles are operated with a 10-minute headway, a vehicle will arrive every 10 minutes resulting in a frequency of six vehicles per hour. Based on the equivalent of two low-floored buses for each LRT vehicle, the relationship between LRT headways and the equivanlent bus headways is illustrated in Figure 4-1. Because buses in an HOV lane must share the lane with traffic, it is not possible to attain the equivalent capacity with a bus/HOV. This means that the bus/HOV option cannot be directly compared to the busway and LRT options.

**Optimizing Operations and Maintenance Costs**

In general, at lower levels of capacity (i.e. 2-car LRT trains), the operation and maintenance (O&M) costs of LRT will be higher than for bus. This is illustrated by the O&M cost comparisons contained in the MIS/DEIS where two-car LRT trains were assumed. As ridership increases and more LRT vehicles are operated in each LRT train, O&M costs for LRT become more efficient than for buses. This is because cars can be added to the LRT trains and increase capacity without increasing the

Figure 4-1
Bus Equivalents of LRT




**20 Minute LRT Headway**

6 Buses/Hour = 10.0 Minute Headway
12 Buses/Hour = 5.0 Minute Headway
18 Buses/Hour = 3.3 Minute Headway
24 Buses/Hour = 2.5 Minute Headway

**10 Minute LRT Headway**

12 Buses/Hour = 5.0 Minute Headway
24 Buses/Hour = 2.5 Minute Headway
36 Buses/Hour = 1.7 Minute Headway
48 Buses/Hour = 1.3 Minute Headway

**5 Minute LRT Headway**

24 Buses/Hour = 2.5 Minute Headway
48 Buses/Hour = 1.3 Minute Headway
72 Buses/Hour = 0.8 Minute Headway
96 Buses/Hour = 0.6 Minute Headway

number of drivers in the system. This effect has been seen in numerous transit systems around the country, and is in fact a major justification of implementing an LRT system. The need for this optimization is magnified even more when the system is used to provide transit access over a short period of time to events within the corridor that attract a large number of person trips. The 2002 Winter Olympic Games are a prime example of that situation. The cost to add and train bus drivers is avoided with LRT as more cars are simply added to the train.

**Contra Flow Transit Operation**

For the Bus/HOV option defined in the MIS/DEIS, buses would operate in the curb lane as illustrated in Figure 4-2. Implementation of a busway that would eventually be converted to LRT will probably require contra flow operation of the buses. Standard buses have doors only on the right side of the vehicle. This means that passenger loading platforms must be on the right-hand side of the bus. In contrast, LRT vehicles have doors on both sides. The passenger loading platform can therefore be on either side of the LRT vehicle. Experience has demonstrated that a single platform located between the two LRT tracks is more efficient and cheaper than two side platforms. Center platforms would therefore be constructed for LRT operation. In order for buses to use the center platforms on an interim basis, they would have to operate in a contra flow mode.

**Definition of Options**

After evaluating a number of possible BRT options, two were selected for detailed study and comparison with the Bus/HOV and LRT options. A total of four options were defined for purposes of analysis and evaluation as follows:

A Bus/HOV, using conventional buses as described in the MIS/DEIS

B BRT - Diesel, dedicated busway using diesel buses

C BRT - Electric, dedicated busway using electric buses

D LRT, dedicated guideway using LRT vehicles

Options B and C incorporate the necessary components that facilitate future conversion to an LRT system. The critical assumptions made for each of the four options are summarized in Table 4.1.

TSM and TDM strategies would be incorporated into each of the four options. TSM strategies, which include increasing the number of turn lanes, would be used at congested intersections to increase the level of service (LOS) and allow cars to travel through the intersections more efficiently. Large employers and other activity/event centers that are generating significant amounts of auto traffic would be encouraged to use TDM strategies to reduce the number of automobile trips their employees and customers make. TDM strategies would include, but are not limited to, subsidizing the use of transit through pass programs, reducing/limiting the availability of parking

**Figure 4-2**
**Bus / LRT Flow vs. Traffic Flow**

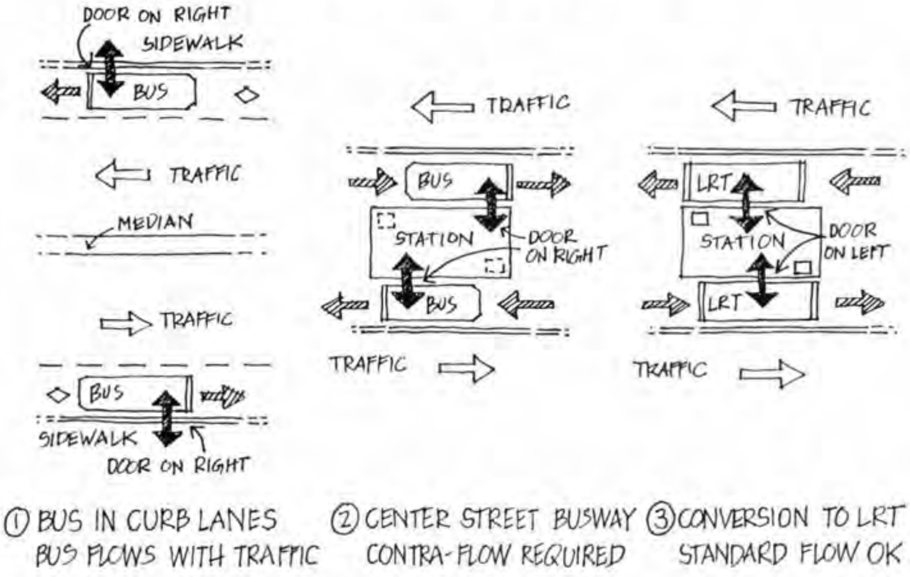


**TABLE 4.1**
**SUMMARY OF OPTION ASSUMPTIONS**

| | OPTION A<br>BUS/HOV | OPTION B<br>BRT - Diesel | OPTION C<br>BRT - Electric | OPTION D<br>LRT |
|---|---|---|---|---|
| Vehicle | conventional bus | articulated bus | articulated bus | Light Rail Vehicle |
| Propulsion | diesel | diesel | electric | electric |
| Revenue Collection | at boarding | ( Passes and Platform Dispensers ) | | |
| On Board Fare Validation | no | yes | yes | yes |
| Passenger Boarding | driver door | all doors | all doors | all doors |
| Vehicle Floor Height | high | low | low | high |
| ADA accessibility | bus lift | bus ramp | bus ramp | high block |
| Platform location | street curb | center of street | center of street | center of street |
| Operating Surface | street-curb lane | concrete busway | concrete busway | LRT track |
| Vehicle Doors | right side | right side | right side | both sides |
| Direction of Travel | with traffic | contra flow | contra flow | with traffice |
| Maintenance Facility | increase capacity requirement | increase capacity requirement | new | exists |
| Storage Facility | increase storage requirement | increase storage requirement | new | new |
| Vehicle Capacity | | | | |
| Seated | 50 | 50 | 50 | 75 |
| Standing | 30 | 30 | 30 | 85 |
| Total | 80 | 80 | 80 | 160 |

or increasing the cost, encouraging employees to work flexible hours, or to telecommute from their homes.

Option A - Bus/HOV

This is the option that was addressed in the MIS/DEIS and mentioned in previous paragraphs. It includes expanded bus service using conventional buses and express buses throughout the corridor in the flow of traffic. Fares would be collected upon boarding at the driver's door, which is the same manner that UTA presently utilizes. Floor height would be high to match the existing fleet, which requires a bus lift for ADA accessibility. Service would be increased at the corridor termini, the SLCIA and University, as well as during peak hour travel times. Conventional bus stops at designated street corners would be part of the operations, which necessitates a right-side door. HOV lanes would be implemented on existing roadways with signs and pavement markings that denote exclusive use by buses and vehicles carrying two or more persons during the peak hours. This option increases the maintenance and storage facility requirements for the UTA system. The existing facilities are presently full with no reserve capacity. No future conversion to an LRT system is assumed for this option.

Option B - BRT Diesel

This option uses low-floored articulated diesel buses. Revenue collection would be accomplished by issuing passes at platform dispensers and validating on-board the bus that passengers have a pass, ticket or transfer. Boarding would be accomplished through all available doors to minimize dwell time. As with other fare validation systems, on-board validation would be done on a random basis. Fare validation is a well established practice in the transit industry and is the method planned for the north/south LRT currently under construction. A bus ramp is required for ADA accessibility with the low-floored vehicle. The busway design will include 13-foot wide platforms in the center of the street to load and unload passengers. The center platforms allow virtually all roadway construction to occur within the existing street of approximately 100 feet between curbs. In order to avoid having special left-side door buses that would not be usable anywhere else in UTA's system, the buses would operate contra flow to allow right-side doors with center platforms (see Figure 4-2). This option increases the maintenance and storage facility requirements that exist within UTA's system.

This option requires the construction of two dedicated busway travel lanes, one 12-foot lane in each direction, in the middle of existing roadway so there will be no potential conflicts with auto traffic except at intersections or interchanges. The busway facility would be constructed so that the system could be converted to an LRT system later. Initially, items such as conduit and track base slab, including the construction of a temporary pavement installed over the track base slab, would be constructed. At the time of conversion from the busway to an LRT system; track, catenary, substations, and other systems elements would need to be added. The general cross-section that would be constructed for the busway, which would be designed for eventual conversion to LRT, is illustrated in Figure 4-3. Significant reconstruction of the busway will need to occur at the time of LRT conversion. Access into the western and eastern termini, the airport and the university respectively, would occur on the same alignment as the LRT alternative, with bus terminals for loading and turnaround at the endpoints.

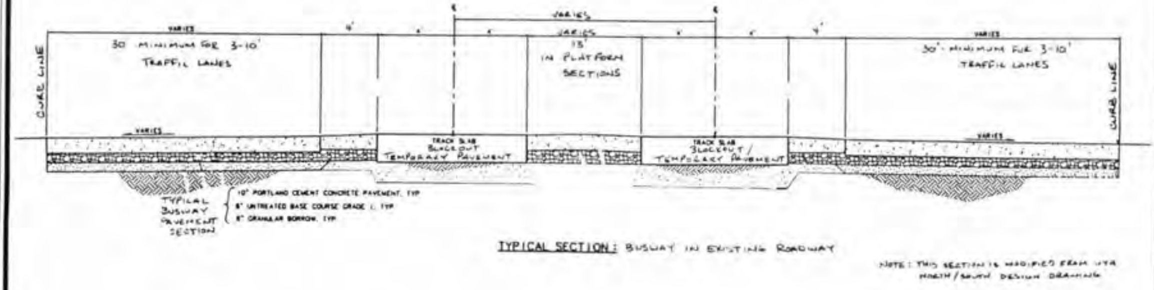
Option C - BRT Electric

This option contains the same busway features as Option B. There would be two dedicated busway lanes for articulated contra-flow buses. However, in order to eliminate air pollution from diesel buses, these buses would be electrically powered which would require different busway facilities, including an overhead double wire catenary system. The busway design would include center platforms for passenger loading and unloading. This will require contra flow bus operation. Bus stations would be at designated locations along the route and would include revenue fare validation as part of the facilities. As in Option B, several elements will be constructed and incorporated into the initial BRT construction. In this case it would include the track base slab, the temporary pavement slab, the substations, and a double wire catenary system. At the time of conversion from the trolley busway to the LRT system; track and other related rail system elements will need to be constructed in the busway. Some of the systems and catenary installed for the electric trolley BRT will be utilized by the LRT system. New maintenance and storage facilities will be required to service the new electric trolley bus fleet. Again, the delay and disruption of service needs to be accounted for in the transit systems operations.

Option D - LRT

This option includes the complete construction of an LRT system without any busway reconstruction costs. Boarding can occur at all doors, and because the vehicle has doors on both sides, LRT can run in the same direction with traffic while utilizing center platforms. On-board fare validation would be used to be consistent with the north/south line. Vehicles on the north/south line are high-floored with high blocks for ADA accessibility, and these would be used in this corridor for continuity. The maintenance facility being constructed for the north/south line is large enough to accommodate both lines, so an additional facility is not required. A new LRT vehicle storage yard will be required. No future conversion costs are incurred with this option.

## Figure 4-3
## General Busway Typical Section



## SECTION 5 - CAPITAL AND O&M COSTS

### System Costs

System costs were estimated for each of the four options described in Section 4. These costs are presented here for comparison. The costs for each option are itemized in the appendix to allow line-for-line comparison between the options. Table 5.1 shows capital and O&M cost estimates for the four options considered. All capital and O&M costs are presented in 1998 dollars for comparison.

**TABLE 5.1**
**COST COMPARISON FOR BUS/HOV, BUSWAY AND LRT OPTIONS**
**(ALL 1998 DOLLARS)**

| COST | A Bus/HOV | B BRT-Diesel | C BRT-Electric | D LRT |
|---|---|---|---|---|
| Total Capital Cost | \$63,566,275 | \$206,229,345 | \$365,241,613 | \$364,250,288 |
| Annual O&M Cost | \$1,828,034 | \$3,797,140 | \$4,912,814 | \$7,390,256 |

As was mentioned in Section 4, Options B, C, and D are intended to supply equivalent passenger capacities for the transit system. Option A does not. In that regard, costs for Option A should stand alone and cannot be directly compared to Options B, C, and D. Costs for Options B, C, and D were calculated assuming a system capacity defined by the bus equivalent of 2-car LRT trains with a headway of 10-minutes. Two additional aspects of Options B and C are critical to the cost calculations:

1. Construction of the BRT is assumed to include items which facilitate conversion to LRT
2. Conversion from the BRT system to LRT would occur in the year 2010

Table 5.2 summarizes the present and future capital costs associated with each of the four options.

**TABLE 5.2**
**COST SUMMARY FOR FUTURE CONVERSION TO LRT**
**(ALL 1998 DOLLARS)**

| COST | A<br>Bus/HOV | B<br>BRT-Diesel | C<br>BRT-Electric | D<br>LRT |
|---|---|---|---|---|
| Total Capital Cost (Initial) | $63,566,275 | $206,229,345 | $365,241,613 | $364,250,288 |
| Incremental Capital Cost to Convert to LRT | 0 | $324,468,072 | $209,500,894 | 0 |
| Total Capital Cost (Future) | $63,566,275 | $530,697,417 | $574,742,507 | $364,250,288 |

A discussion of the costs for each option follows.

Option A - Bus/HOV

**Capital Costs** - This option represents the "bare bones" bus alternative and requires a relatively small capital investment of $63.6 million. As mentioned above, Option A does not deliver equivalent system capacity, and cannot be directly compared to Options B, C, and D. This option does not assume future conversion to LRT. Future conversion to LRT could utilize virtually none of this capital investment.

**O&M Costs** - Operation and maintenance of this Bus/HOV system is estimated at $1.83 million annually. The majority of this cost is associated with the vehicles and operators.

Option B - BRT Diesel

**Capital Costs** - Estimated at $206.2 million, capital costs for this option are considerably higher than for the Bus/HOV option. This is largely due to the increased capacity of the system, and the civil costs of building the busway, bridges, platforms, and transit centers required for the system. As mentioned previously, a part of this investment will facilitate future conversion to LRT, but the capital cost of $324.5 million (1998 $) incurred in the year 2010 to make the conversion is 157% of the initial capital investment for the busway. The majority of the future conversion costs are for roadway reconstruction to put in the tracks, propulsion system, and purchasing the LRT vehicles. The total capital investment (present plus future) in 1998 dollars is $530.7 million.

**O&M Costs** - Annual O&M costs for this option are estimated at $3.80 million. The increase over the Bus/HOV option is due to the increased number of peak vehicles (more vehicles in service) which increases the platform hours (hours of bus in service) and total vehicle miles.

Option C - BRT Electric

**Capital Costs** - Capital costs for Option C rise significantly from Option B to $365.2 million. The increase is mostly due to the systems and double catenary that are required for the electric trolley. Also, the cost of electric buses is more than twice the cost of diesel buses. This option requires a smaller future capital investment than does Option B, but at $209.5 million, the future conversion investment is not trivial. The total capital investment (present plus future) in 1998 dollars is $574.7 million. This is higher than Option B because of the redundant investment in systems and electrification in Option C as well as the purchase of the more expensive electric trolley buses.

**O&M Costs** - Annual O&M costs for this option are estimated at $4.91 million. The increase over Option B is mostly due to the O&M of the catenary and the accompanying electric power facilities.

Option D - LRT

**Capital Costs** - Capital costs for the LRT system are estimated at $364.3 million. This cost estimate is made assuming an LRT headway of 10-minutes with two-car trains during peak hours of operation. This represents the largest up-front capital investment of the four options considered. The major capital costs are associated with purchasing the vehicles, reconstructing the existing roadway, constructing the tracks and building the power supply system. There is no future conversion cost for this option, so the $364.3 million investment compares directly with the $530.7 million in Option B, and the $574.7 million in Option C. When the future conversion is accounted for, capital investment in Option D is only 69% and 63% of the capital costs for Options B and C respectively.

**O&M Costs** - Annual O&M costs for Option D are estimated at $7.39 million.

## SECTION 6 - EVALUATION OF TRANSIT OPTIONS

### Previous Policy Action Regarding Busways

As documented earlier in this report, the general public and elected officials of Salt Lake County in 1994 evaluated the option of using busways as the backbone of the regional transit system. It was determined at that time that busways were not significantly cheaper than LRT. Electric LRT vehicles do not have the air quality impact of diesel buses. The downtown community strongly supported LRT as a means of reducing the high number of buses already being operated on local streets. There was a high level of consensus that the community preferred LRT over busways as the selected mode of transportation for the MIS/DEIS West/East Study. Because of this well-established preference for LRT rather than busways, there is likely to be less than enthusiastic acceptance of a busway as an interim step.

### Capital Costs of Future Upgrade from Busway to LRT

While it is true that a busway can be constructed at a lower up-front capital cost compared to LRT, when the future capital costs to convert to LRT are considered, the LRT option is much less expensive. In 1998 dollars, Option B - BRT Diesel has an up-front capital cost of $206.2 million and a future upgrade cost of $324.5 million, bringing the total capital investment to $530.7 million. Similarly, Option C - BRT Electric has an up-front capital cost of $365.2 million and a future upgrade cost of $209.5 million, bringing the total capital investment to $574.7 million. Option D - LRT can be constructed at a capital cost of $364.3 million with no future upgrade capital costs.

As part of the system reconstruction process, there will be non-recoverable costs associated with LRT conversion. There will be significant elements, such as concrete pavement, that will have to be constructed for the busway that will not be needed when LRT is installed. High cost concrete pavement for the busway system would be torn out during reconstruction. Total cost of the eventual LRT system will be increased by non-recoverable costs involved in constructing the busway system as an interim transit system solution. Moreover, depending upon the number of years of busway operation, conduit, tracks and other LRT elements placed in the busway pavement during BRT construction may need to be replaced due to weathering and equipment age.

### System Impacts on Intersection Capacity and Downtown Environment

With regard to busway and LRT system capacity, as the number of LRT cars per train increases, the number of bus drivers will increase proportionately at a 2:1 ratio to provide equivalent capacity (See Figure 4-1). For example, equivalent capacity for 4-car LRT trains on a 10-minute headway would require 48 articulated buses and drivers per hour (or one bus every 1.25 minutes). Typical traffic signal cycle lengths along 400 South in Salt Lake City are about 1.3 minutes (about 46 cycles per hour). This means that a bus preemption would occur during each signal cycle at every intersection. On the other hand, at a headway of 10 minutes, only 6 LRT vehicles per hour are required which means an LRT signal preemption would occur only once in 7.7 signal cycles. The impact of LRT on traffic operations is therefore much less than it would be for a BRT. One of the major reasons the downtown community supported the LRT alternative was because of its potential to reduce the number of buses operating on downtown streets.

In addition to the impact on intersections and overall congestion, operation of buses in a busway would have an impact on air quality in the downtown area and throughout the corridor. The need and desire to improve air quality would be adversely impacted by the exhaust generated from diesel buses operating in the corridor. Alternative fuel buses could be utilized, but both capital and O&M costs would increase.

**Implementation Schedule**

One of the key considerations in this analysis was the implementation schedule. An operational transit system in the West/East Corridor would be a great help in moving people during the 2002 Winter Olympics. UTA has put together a schedule for LRT implementation that shows LRT operations on the West/East Line starting January, 2002. The schedule is contained in the appendix. UTA's familiarity with design standards and specifications for the North/South line would save time in designing and constructing the West/East line. Considerable time was spent gaining the consensus of the Downtown Enhancement Committee on issues such as platform configuration. This consensus does not exist for a busway, and gaining that consensus will require additional coordination and time. With LRT selected as the Locally Preferred Alternative in the DEIS, the schedule would be set back at least 6 months to accommodate the public involvement and public hearings that would be required to redefine the LPA. This may affect the ability to get a busway designed and constructed in time for the Olympics.

**2002 Winter Olympic Games**

The Winter Olympic Games in the year 2002 are a special example of the need for flexibility in the West/ East Corridor transit system. Opening ceremonies will be at the University of Utah stadium. Olympic housing is also at the University of Utah. Award ceremonies will be held each evening in downtown Salt Lake City which will involve up to 25,000 people. These ceremonies will coincide with other events at the Delta Center along with movement of media and spectators on an ongoing basis. Efficient handling of general public and media travel will be important in order to provide a high level of specialized transportation for official Olympic competitors, coaches and officials. Transportation officials for the recent Olympics in Atlanta reported some difficulty in getting competitors, coaches and officials to events on time for that very reason. LRT has the ability to adjust capacity to accommodate this variation in travel demand with greater efficiency and less congestion than a busway.

**Air Quality**

Salt Lake City is borderline non-attainment for air quality. With the high frequency bus service associated with a busway, bus emissions could have a drastic negative affect on air quality in Salt Lake City. This issue could be mitigated to a point by using buses powered by alternative fuels. LRT vehicles would help improve the air quality by eliminating diesel emissions.

**Frequency of Service with BRT**

One of the more important factors in attracting riders to a transit system is to minimize the waiting time at bus stops or stations. In this regard, BRT represents a higher level of service for the transit user. The higher frequency of buses with BRT would likely reduce the average wait time at each bus stop, thus making the level of transit service more attractive. This represents a rather direct tradeoff between users of the overall transportation system. Whereas the higher frequency of buses has an adverse impact on traffic operations, it has a positive benefit for transit users.

**Flexibility in Transit Capacity**

The West/East Corridor contains numerous special generators where a high volume of person trips are attracted which will require a wide range of flexibility in transit capacity. The distribution of population and employment in the corridor generates a need for daily transit service that is frequent and efficient. Residents and tourists on both the west and east ends of the corridor will benefit from convenient access to all of the special generators. Special generators in the corridor attract over 50 million person trips per year today. This will increase dramatically in the future. When events take place at any or several of these special generators, the transit system must have the capacity to provide significantly higher and more frequent service. This can best be accomplished with LRT where more capacity can be added by increasing the number of cars in each train. Capacity is added without any increase in drivers. The number of operating units does not increase at signalized intersections. Residents and tourists on both the west and east ends of the corridor will benefit from convenient access to all of the special generators.

**Reliability of Service During Snow Storms**

Typical winters along the Wasatch Front bring numerous snowfall events with significant accumulations. LRT operations can be continued during and after these events resulting in highly reliable transit service when passengers need it most. Up to one foot of snow can accumulate before the LRT vehicle becomes hindered. Bus service could experience long delays while the busway is plowed. Similarly, icy conditions on the busway will hinder bus passage. Difficulty with snow removal during the Olympic Games would be especially undesirable.

**Impact on Transit Service, Ridership and Traffic During Upgrade**

While the upgrade construction activities are taking place, the bus operation either has to be suspended, or moved out into the general traffic flow. Assuming that the operation would be temporarily moved curb-side, there would be immediate impacts to the level of service provided. The temporary arrangement at bus stops would impact passengers riding the system in terms of logistics such as temporary stops, schedule, and ADA access. All of these factors would tend to reduce ridership. Experience has shown that it would take considerable time to recapture that ridership once the LRT is in place. In addition to the impact on ridership, temporary operation of buses in adjacent traffic lanes will reduce the capacity and level of service for local traffic. Traffic congestion downtown would increase significantly during reconstruction to LRT.

**Interface of Modes Between Corridors**

Since the North/South Corridor is currently being constructed as an LRT line, there is the issue of either buses or LRT vehicles interfacing with the W/E line. If a busway is initially constructed in the W/E corridor, it will eliminate the ability to interline LRT vehicles from one corridor to the other. Having an LRT system in both the N/S and W/E corridors would provide a more compatible transit network for Salt Lake County. For example, special event trains from Sandy to the University would provide a one-seat ride without a transfer. This would not be the case with a W/E busway.

If the recommended W/E LRT line is constructed, it would combine with the N/S LRT line now under construction to create a 4-block square "loop" in the downtown area. This loop would create the opportunity for local loop service around the central business district. If a busway is constructed as an interim system for the W/E corridor, the LRT loop would not be possible until the busway is upgraded to LRT.

**Cost Effectiveness of Transit Options**

The results of this analysis demonstrate that for operation and maintenance, buses operating in a busway will be cost effective for low to medium levels of transit ridership. Because LRT capacity can be increased without adding drivers as ridership increases, operation of LRT at higher capacity levels (3 to 4 car trains) is likely to be more cost effective. This long-term cost effectiveness of LRT systems has been demonstrated in numerous cities throughout the country and the world.

**Commuter Rail**

Plans are under way to implement a commuter rail system along the Wasatch Valley from Brigham City on the north to Payson on the south. An intermodal facility is being planned for 200 South and 600 West. If commuter rail is eventually put into operation along the Wasatch Front, it will deliver several hundred people in one train who will all arrive at the same time. The flexible capacity of LRT is likely to be more capable of accommodating this periodic influx of a large volume of passengers than would a series of buses operating on a busway.

### Transit Vehicle Fleets and Maintenance/Storage Facilities

Transit operating experience over many years has demonstrated that efficiency and reliability is maximized with fewer unique types of transit vehicle fleets. A successful and efficient busway would require a relatively small number of very unique low-floored (possibly electric) transit vehicles. Maintenance and storage facilities would have to be expanded and modified to maintain this different transit vehicle. Because the decision was previously made to implement LRT in major transit corridors, the LRT maintenance and storage facilities will require minimal or no expansion to accommodate the additional LRT vehicles needed for West/East operation.

### Transportation Centers at Airport and University of Utah

Considerable planning and engineering has already been completed to design an effective LRT transit station as part of the new transportation center to be constructed at the airport. If a busway is implemented as an interim step, a larger and more expensive bus terminal will need to be constructed with adequate space for bus loading/unloading and turnaround. Disruption during conversion from bus terminal to LRT terminal would be unacceptable to both airport and transit operations. Similarly, planning is now underway to construct a joint development facility at the University of Utah Health Sciences Center which would incorporate an LRT station. Initial construction of a bus terminal with later conversion to an LRT station may not be reasonable or feasible.

### Flexibility of Operation

Since LRT vehicles have operating doors on both sides at each vehicle, they can readily function for both center or side platform station operations. Normally, buses do not have this capability and, as such, cannot readily adapt to function at center and side platform status. To do so would require weaving from normal flow to contra flow and then back to normal flow lanes. This would be awkward and confusing. If the buses were equipped to operate with doors on both sides, the seating capacity would be greatly reduced, therefore. Therefore, it would reduce the overall vehicle carrying capacity for each bus. The buses would also be more expensive and have higher O&M costs due to the multiple door configuration.

## SECTION 7 - CONCLUSION

Based on the information and analysis presented in this report, it is reasonable to conclude that construction of BRT in the West/Eeast Corridor as an interim phase prior to constructing an LRT system would result in a substantially higher cost in the long run. The interim BRT phase would add up to $210 million in cost over the estimated cost of $364 million to construct LRT initially. In addition, there are disbenefits and inefficiencies that would occur during the period of BRT operation. Finally, there would be major disruption of both transit and traffic operations for a considerable period of time when the BRT busway is physically converted to an LRT configuration.

# APPENDIX

TABLE A.1

OPTION A: BUS/HOV

CONVENTIONAL BUSES

CURB-SIDE STATIONS

| | Unit Cost | # Units | Life Expectancy (Years) | Capital Cost | Annualized Capital Cost | Conv. Unit Cost | Conv. # Units | Capital Conv. Cost | Annnualized Caapital Convversion CCost |
|---|---|---|---|---|---|---|---|---|---|
| **CAPITAL COSTS (1998 $)** | | | | | | | | | |
| Conv. Buses to expand fleet | $250,000 | 18 | 10 | $4,500,000 | $640,699 | $250,000 | 0 | $0 | $0 |
| New LRT Vehicles | $2,100,000 | 0 | 25 | $0 | $0 | $2,100,000 | 0 | $0 | $0 |
| Marking & Signing | $1,060,000 | 1 | 10 | $1,060,000 | $150,920 | $215,000 | 0 | $0 | $0 |
| Roadway Construction | $0 | 1 | 20 | $0 | $0 | | 0 | $0 | $0 |
| TSM - Signals/Controllers | $1,600,000 | 1 | 10 | $1,600,000 | $227,804 | $1,600,000 | 0 | $0 | $0 |
| Airport Transportation Center | $2,125,000 | 1 | 30 | $2,125,000 | $171,246 | $2,000,000 | 0 | $0 | $0 |
| U of U Transportation Center | $2,125,000 | 1 | 30 | $2,125,000 | $171,246 | $2,000,000 | 0 | $0 | $0 |
| 2400 W | $2,125,000 | 1 | 30 | $2,125,000 | $171,246 | $2,000,000 | 0 | $0 | $0 |
| U of U Stadium | $2,125,000 | 1 | 30 | $2,125,000 | $171,246 | $2,000,000 | 0 | $0 | $0 |
| Park and Rides | $1,380,000 | 4 | 20 | $5,520,000 | $521,049 | $0 | 0 | $0 | $0 |
| Maint. Facility - Conv. Buses | $1,500,000 | 1 | 30 | $1,500,000 | $120,880 | | 0 | $0 | $0 |
| Storage Facility - Conv. Buses | $500,000 | 1 | 30 | $500,000 | $40,293 | | 0 | $0 | $0 |
| Right of Way | $2.70 | 2,000,000 | 100 | $5,400,000 | $378,436 | $2.70 | 0 | $0 | $0 |
| Center Platform | $425,000 | 0 | 30 | $0 | $0 | $32,000 | 0 | $0 | $0 |
| Curb-side Bus Stop | $20,000 | 24 | 30 | $480,000 | $38,681 | | 0 | $0 | $0 |
| Revenue Collection | $300,000 | 0 | 20 | $0 | $0 | | 0 | $0 | $0 |
| Structures | $4,200 | 0 | 30 | $0 | $0 | | 0 | $0 | $0 |
| Amenities | $3,000,000 | 1 | 20 | $3,000,000 | $283,179 | | 0 | $0 | $0 |
| Systems Elect. | $1,060 | 0 | 30 | $0 | $0 | $1,060 | 0 | $0 | $0 |
| TDM Program | $525,000 | 1 | 2 | $525,000 | $290,373 | | 0 | $0 | $0 |
| Bridges | $4,200,000 | 0 | 30 | $0 | $0 | | 0 | $0 | $0 |
| Tracks | $275 | 0 | 30 | $0 | $0 | | 0 | $0 | $0 |
| | | | | | | | | | |
| SUM | | | | $32,585,000 | $3,377,299 | | | $0 | $0 |
| 30% CONTINGENCIES (Not Including Vehicles) | | | | $8,425,500 | $820,980 | | | $0 | $0 |
| | | | | | | | | | |
| SUBTOTAL | | | | $41,010,500 | $4,198,279 | | | $0 | $0 |
| | | | | | | | | | |
| 15% ENGINEERING DESIGN | | | | $6,151,575 | $629,742 | | | $0 | $0 |
| 15% CM | | | | $6,151,575 | $629,742 | | | $0 | $0 |
| 15% PROJECT ADMINISTRATION | | | | $6,151,575 | $629,742 | | | $0 | $0 |
| 5% PRE-OPERATIONS | | | | $2,050,525 | $209,914 | | | $0 | $0 |
| 5% INSURANCE | | | | $2,050,525 | $209,914 | | | $0 | $0 |
| | | | | | | | | | |
| TOTAL CAPITAL COSTS (1998 $) | | | | $63,566,275 | $6,507,332 | | | $0 | $0 |
| | | | | | | | | | |
| | | | | | | Adj. to 2010 Prices (3% Inflation) | | $0 | $0 |
| **OPERATIONS & MAINTENANCE COSTS (1998 $) - see model** | | | | | | | | | |
| Adjusted UTA Bus Ops Model | $1,828,034 | 1 | 1 | $1,828,034 | $1,828,034 | | | | |
| | | | | | | | | | |
| TOTAL O&M COSTS (1998 $) | | | | | $1,828,034 | | | | |
| | | | | | | | | | |
| TOTAL COSTS (1998 $) | | | | | $8,335,366 | | | | |

Note: DEIS dollar amounts adjusted at 3% inflation per year

Annualization assumes 7% interest rate

Parsons Transportation Group

1/13/98

| TBLE A.2 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| OTION B: BRT - DIESEL | | | | | | | | | |
| LW-FLOORED ARTICULATED BUSES | | | | | | | | | |
| CNTER PLATFORMS | | | | | | | | | |
| Pvisions made in initial construction for future conversion to LRT | | | | | | | | | |
| | Unit Cost | # Units | Life Expectancy (Years) | Capital Cost | Annualized Capital Cost | Conv. Unit Cost | Conv. # Units | Capital Conv. Cost | Annualized Capital Conversion Cost |
| CPITAL COSTS (1998 $) | | | | | | | | | |
| New Artic. Buses (low floor) | $375,000 | 32 | 10 | $12,000,000 | $1,708,530 | $375,000 | 0 | $0 | $0 |
| New LRT Vehicles | $2,100,000 | 0 | 25 | $0 | $0 | $2,100,000 | 16 | $33,600,000 | $2,883,233 |
| Marking & Signing | $215,000 | 1 | 10 | $215,000 | $30,611 | $215,000 | 0 | $0 | $0 |
| Roadway Construction | $390 | 53,370 | 20 | $20,814,300 | $1,964,723 | $263 | 53,370 | $14,036,310 | $1,324,928 |
| TSM - Signals/Controllers | $1,600,000 | 1 | 10 | $1,600,000 | $227,804 | $1,600,000 | 1 | $1,600,000 | $227,804 |
| Airport Transportation Center | $2,125,000 | 1 | 30 | $2,125,000 | $171,246 | $2,125,000 | 1 | $2,125,000 | $171,246 |
| U of U Transportation Center | $2,125,000 | 1 | 30 | $2,125,000 | $171,246 | $2,125,000 | 1 | $2,125,000 | $171,246 |
| 2400 W | $2,125,000 | 1 | 30 | $2,125,000 | $171,246 | $2,125,000 | 1 | $2,125,000 | $171,246 |
| U of U Stadium | $2,125,000 | 1 | 30 | $2,125,000 | $171,246 | $2,125,000 | 1 | $2,125,000 | $171,246 |
| Park and Rides | $1,380,000 | 4 | 20 | $5,520,000 | $521,049 | $500,000 | 1 | $500,000 | $47,196 |
| Maint. Facility - Artic. Buses | $3,206,000 | 1 | 30 | $3,206,000 | $258,360 | $ | 1 | $0 | $0 |
| Storage Facility - Artic. Buses | $1,000,000 | 1 | 30 | $1,000,000 | $80,586 | $4,625,000 | 1 | $4,625,000 | $372,712 |
| Right of Way | $2.70 | 2,000,000 | 100 | $5,400,000 | $378,436 | $2.70 | 301,100 | $812,970 | $56,974 |
| Center Platform | $425,000 | 14 | 30 | $5,950,000 | $479,489 | $32,000 | 14 | $448,000 | $36,103 |
| Curb-side Bus Stop | $20,000 | 0 | 30 | $0 | $0 | | 0 | $0 | $0 |
| Revenue Collection | $300,000 | 0 | 20 | $0 | $0 | | 0 | $0 | $0 |
| Structures | $4,200 | 4330 | 30 | $18,186,000 | $1,465,544 | | 0 | $0 | $0 |
| Amenities | $13,800,000 | 1 | 20 | $13,800,000 | $1,302,622 | | 0 | $0 | $0 |
| Systems Elect. | $1,060 | 0 | 30 | $0 | $0 | $1,060 | 53,370 | $56,572,200 | $4,558,950 |
| TDM Program | $525,000 | 1 | 2 | $525,000 | $290,373 | | 0 | $0 | $0 |
| Bridges | $4,200,000 | 2 | 30 | $8,400,000 | $676,926 | | 0 | $0 | $0 |
| Tracks | $275 | 0 | 30 | $0 | $0 | | 0 | $0 | $0 |
| | | | | | | | | | |
| SUM | | | | $105,116,300 | $10,070,039 | | | $120,694,480 | $10,192,885 |
| 3% CONTINGENCIES (Not Including Vehicles) | | | | $27,934,890 | $2,508,453 | | | $26,128,344 | $2,192,896 |
| | | | | | | | | | |
| SUBTOTAL | | | | $133,051,190 | $12,578,491 | | | $146,822,824 | $12,385,781 |
| | | | | | | | | | |
| 1% ENGINEERING DESIGN | | | | $19,957,679 | $1,886,774 | | | $22,023,424 | $1,857,867 |
| 1% CM | | | | $19,957,679 | $1,886,774 | | | $22,023,424 | $1,857,867 |
| 1% PROJECT ADMINISTRATION | | | | $19,957,679 | $1,886,774 | | | $22,023,424 | $1,857,867 |
| % PRE-OPERATIONS | | | | $6,652,560 | $628,925 | | | $7,341,141 | $619,289 |
| % INSURANCE | | | | $6,652,560 | $628,925 | | | $7,341,141 | $619,289 |
| | | | | | | | | | |
| TOTAL CAPITAL COSTS (1998 $) | | | | $206,229,345 | $19,496,661 | | | $227,575,377 | $19,197,960 |
| | | | | | | | | | |
| | | | | | | Adj. to 2010 Prices (3% Inflation) | | $324,468,072 | $27,371,701 |
| | | | | | | | | | |
| CERATIONS & MAINTENANCE COSTS (1998 $) | | | | | | | | | |
| Adjusted UTA Bus Ops Model | $3,797,140 | 1 | $3,797,140 | 1 | $3,797,140 | | | | |
| | | | | | | | | | |
| TOTAL O&M COSTS (1998 $) | | | | | $3,797,140 | | | | |
| | | | | | | | | | |
| TOTAL COSTS (1998 $) | | | | | $23,293,801 | | | | |
| | | | | | | | | | |
| Ne: DEIS dollar amounts adjusted at 3% inflation per year | | | | | | | | | |
| Annualization assumes 7% interest rate | | | | | | | | | |

**TABLE A.3**

**OPTION C: BRT - ELECTRIC**

**LOW-FLOORED ARTICULATED ELECTRIC TROLLEY BUSES**

**CENTER PLATFORMS**

**Provisions made in initial construction for future conversion to LRT**

| | | Unit Cost | # Units | Life Expectancy (Years) | Capital Cost | Annualized Capital Cost | Conv. Unit Cost | Conv. # Units | Capital Conv. Cost | Annualized Capital Conversion Cost |
|---|---|---|---|---|---|---|---|---|---|---|
| **CAPITAL COSTS (1998 $)** | | | | | | | | | | |
| | New Electric Trolley Buses | $900,000 | 32 | 25 | $28,800,000 | $2,471,343 | $900,000 | 0 | $0 | $0 |
| | New LRT Vehicles | $2,100,000 | 0 | 25 | $0 | $0 | $2,100,000 | 16 | $33,600,000 | $2,883,233 |
| | Marking & Signing | $215,000 | 1 | 10 | $215,000 | $30,611 | $215,000 | 0 | $0 | $0 |
| | Roadway Construction | $390 | 53,370 | 20 | $20,814,300 | $1,964,723 | $263 | 53,370 | $14,036,310 | $1,324,928 |
| | TSM - Signals/Controllers | $1,600,000 | 1 | 10 | $1,600,000 | $227,804 | $1,600,000 | 1 | $1,600,000 | $227,804 |
| | Airport Transportation Center | $2,125,000 | 1 | 30 | $2,125,000 | $171,246 | $2,125,000 | 1 | $2,125,000 | $171,246 |
| | U of U Transportation Center | $2,125,000 | 1 | 30 | $2,125,000 | $171,246 | $2,125,000 | 1 | $2,125,000 | $171,246 |
| | 2400 W | $2,125,000 | 1 | 30 | $2,125,000 | $171,246 | $2,125,000 | 1 | $2,125,000 | $171,246 |
| | U of U Stadium | $2,125,000 | 1 | 30 | $2,125,000 | $171,246 | $2,125,000 | 1 | $2,125,000 | $171,246 |
| | Park and Rides | $1,380,000 | 4 | 20 | $5,520,000 | $521,049 | $500,000 | 1 | $500,000 | $47,196 |
| | Maint. Facility - Elec. Trolley | $9,000,000 | 1 | 30 | $9,000,000 | $725,278 | $1,500,000 | 1 | $1,500,000 | $120,880 |
| | Storage Facility - Elec. Trolley | $4,625,000 | 1 | 30 | $4,625,000 | $372,712 | $1,000,000 | 1 | $1,000,000 | $80,586 |
| | Right of Way | $2.70 | 2,000,000 | 100 | $5,400,000 | $378,436 | $2.70 | 301,100 | $812,970 | $56,974 |
| | Center Platform | $425,000 | 14 | 30 | $5,950,000 | $479,489 | $32,000 | 14 | $448,000 | $36,103 |
| | Curb-side Bus Stop | $20,000 | 0 | 30 | $0 | $0 | | 0 | $0 | $0 |
| | Revenue Collection | $300,000 | 0 | 20 | $0 | $0 | | 0 | $0 | $0 |
| | Structures | $4,200 | 4,330 | 30 | $18,186,000 | $1,465,544 | | 0 | $0 | $0 |
| | Amenities | $13,800,000 | 1 | 20 | $13,800,000 | $1,302,622 | | 0 | $0 | $0 |
| | Systems Elect. | $1,060 | 53,370 | 30 | $56,572,200 | $4,558,950 | $350 | 53,370 | $18,679,500 | $1,505,314 |
| | TDM Program | $525,000 | 1 | 2 | $525,000 | $290,373 | | 0 | $0 | $0 |
| | Bridges | $4,200,000 | 2 | 30 | $8,400,000 | $676,926 | | 0 | $0 | $0 |
| | Tracks | $275 | 0 | 30 | $0 | $0 | | 0 | $0 | $0 |
| | SUM | | | | $187,907,500 | $16,150,845 | | | $80,676,780 | $6,968,003 |
| 30% | CONTINGENCIES (Not Including Vehicles) | | | | $47,732,250 | $4,103,851 | | | $14,123,034 | $1,225,431 |
| | SUBTOTAL | | | | $235,639,750 | $20,254,696 | | | $94,799,814 | $8,193,433 |
| 15% | ENGINEERING DESIGN | | | | $35,345,963 | $3,038,204 | | | $14,219,972 | $1,229,015 |
| 15% | CM | | | | $35,345,963 | $3,038,204 | | | $14,219,972 | $1,229,015 |
| 15% | PROJECT ADMINISTRATION | | | | $35,345,963 | $3,038,204 | | | $14,219,972 | $1,229,015 |
| 5% | PRE-OPERATIONS | | | | $11,781,988 | $1,012,735 | | | $4,739,991 | $409,672 |
| 5% | INSURANCE | | | | $11,781,988 | $1,012,735 | | | $4,739,991 | $409,672 |
| | TOTAL CAPITAL COSTS (1998 $) | | | | $365,241,613 | $31,394,776 | | | $146,939,712 | $12,699,822 |
| | | | | | | | **Adj. to 2010 Prices (3% Inflation)** | | $209,500,894 | $18,106,909 |
| **OPERATIONS & MAINTENANCE COSTS (1998 $)** | | | | | | | | | | |
| | Adjusted UTA Bus Ops Model | $4,912,814 | 1 | $4,912,814 | 1 | $4,912,814 | | | | |
| | TOTAL O&M COSTS (1998 $) | | | | | $4,912,814 | | | | |
| | TOTAL COSTS (1998 $) | | | | | $36,307,592 | | | | |

**Note: DEIS dollar amounts adjusted at 3% inflation per year**

**Annualization assumes 7% interest rate**

**TABLE A.4**

**OPTION D: LRT**
**CENTER PLATFORMS**

| | | Unit Cost | # Units | Life Expectancy (Years) | Capital Cost | Annualized Capital Cost | Conv. Unit Cost | Conv. # Units | Capital Conv. Cost | Annualized Capital Conversion Cost |
|---|---|---|---|---|---|---|---|---|---|---|
| **CAPITAL COSTS (1998 $)** | | | | | | | | | | |
| | New Buses to expand fleet | $375,000 | 0 | 10 | $0 | $0 | $375,000 | 0 | $0 | $0 |
| | New LRT Vehicles | $2,100,000 | 16 | 25 | $33,600,000 | $2,883,233 | $2,100,000 | 0 | $0 | $0 |
| | Marking & Signing | $215,000 | 1 | 10 | $215,000 | $30,611 | $215,000 | 0 | $0 | $0 |
| | Roadway Construction | $190 | 53,370 | 20 | $10,140,300 | $957,173 | $263 | 0 | $0 | $0 |
| | TSM - Signals/Controllers | $1,600,000 | 1 | 10 | $1,600,000 | $227,804 | $1,600,000 | 0 | $0 | $0 |
| | Airport Transportation Center | $2,125,000 | 1 | 30 | $2,125,000 | $171,246 | $2,125,000 | 0 | $0 | $0 |
| | U of U Transportation Center | $2,125,000 | 1 | 30 | $2,125,000 | $171,246 | $2,125,000 | 0 | $0 | $0 |
| | 2400 W | $2,125,000 | 1 | 30 | $2,125,000 | $171,246 | $2,125,000 | 0 | $0 | $0 |
| | U of U Stadium | $2,125,000 | 1 | 30 | $2,125,000 | $171,246 | $2,125,000 | 0 | $0 | $0 |
| | Park and Rides | $1,380,000 | 4 | 20 | $5,520,000 | $521,049 | $500,000 | 0 | $0 | $0 |
| | Maint. Facility - LRT cars | $0 | 1 | 30 | $0 | $0 | $0 | 0 | $0 | $0 |
| | Storage Facility - LRT cars | $4,625,000 | 1 | 30 | $4,625,000 | $372,712 | $1,500,000 | 0 | $0 | $0 |
| | Right of Way | $2.70 | 2,301,100 | 100 | $6,212,970 | $435,410 | $2.70 | 0 | $0 | $0 |
| | Center Platform | $425,000 | 14 | 30 | $5,950,000 | $479,489 | $32,000 | 0 | $0 | $0 |
| | Curb-side Bus Stop | $20,000 | 0 | 30 | $0 | $0 | | 0 | $0 | $0 |
| | Revenue Collection | $300,000 | 0 | 20 | $0 | $0 | | 0 | $0 | $0 |
| | Structures | $4,200 | 4,330 | 30 | $18,186,000 | $1,465,544 | | 0 | $0 | $0 |
| | Amenities | $13,800,000 | 1 | 20 | $13,800,000 | $1,302,622 | | 0 | $0 | $0 |
| | Systems Elect. | $1,060 | 53,370 | 30 | $56,572,200 | $4,558,950 | $1,060 | 0 | $0 | $0 |
| | TDM Program | $525,000 | 1 | 2 | $525,000 | $290,373 | | 0 | $0 | $0 |
| | Bridges | $4,200,000 | 2 | 30 | $8,400,000 | $676,926 | | 0 | $0 | $0 |
| | Tracks | $275 | 53,370 | 30 | $14,676,750 | $1,182,746 | | 0 | $0 | $0 |
| | SUM | | | | $188,523,220 | $16,069,628 | | | $0 | $0 |
| 30% | CONTINGENCIES (Not Including Vehicles) | | | | $46,476,966 | $3,955,918 | | | $0 | $0 |
| | SUBTOTAL | | | | $235,000,186 | $20,025,546 | | | $0 | $0 |
| 15% | ENGINEERING DESIGN | | | | $35,250,028 | $3,003,832 | | | $0 | $0 |
| 15% | CM | | | | $35,250,028 | $3,003,832 | | | $0 | $0 |
| 15% | PROJECT ADMINISTRATION | | | | $35,250,028 | $3,003,832 | | | $0 | $0 |
| 5% | PRE-OPERATIONS | | | | $11,750,009 | $1,001,277 | | | $0 | $0 |
| 5% | INSURANCE | | | | $11,750,009 | $1,001,277 | | | $0 | $0 |
| | TOTAL CAPITAL COSTS (1998 $) | | | | $364,250,288 | $31,039,596 | | | $0 | $0 |
| | | | | | | | **Adj. to 2010 Prices** | | $0 | $0 |
| | | | | | | | **(3% Inflation)** | | | |
| **OPERATIONS & MAINTENANCE COSTS (1998 $) - see model** | | | | | | | | | | |
| | UTA LRT Ops Model | $7,390,256 | 1 | $7,390,256 | 1 | $7,390,256 | | | | |
| | TOTAL O&M COSTS (1998 $) | | | | | $7,390,256 | | | | |
| | TOTAL COSTS (1998 $) | | | | | $38,429,852 | | | | |

**Note: DEIS dollar amounts adjusted at 3% inflation per year**
**Annualization assumes 7% interest rate**

## TABLE A.5
## OPERATION & MAINTENANCE COSTS FOR OPTION A: BUS/HOV

| Cost Component | Unit Cost | Units | Opt. A-Bus/ HO |
|---|---|---|---|
| 1 Admin & Scheduling Labor | $3.90 | $/plat hour | |
| Platform hours | | | 33,540 |
| Costs | | | $130,806 |
| 2 Oper. Wages & Fringe | $19.23 | $/plat hour | |
| Platform hours | | | 33540 |
| Costs | | | $644,974 |
| 3 Fuel & Labor | $0.17 | $/veh mile | |
| Vehicle miles | | | 583,400 |
| Costs | | | $99,178.00 |
| 4 Tubes and Tires | $2,399 | $/peak veh | |
| Peak vehicles | | | 18 |
| Costs | | | $43,187 |
| 5 Vehicle Maint. Admin Labor | $0.13 | $/veh mile | |
| Vehicle miles | | | 583,400 |
| Costs | | | $75,842 |
| 6 Facilities Maint. Admin Labor | $16,290 | $/garage | |
| Garage | | | 1 |
| Costs | | | $16,290 |
| 7 Servicing Revenue Veh. Labor | $5,276 | $/peak veh | |
| Peak vehicles | | | 18 |
| Costs | | | $94,968 |
| 8 Vehicle Inspect., Maint., Repair (Labor) | $0.42 | $/veh. mile | |
| Vehicle miles | | | 583,400 |
| Costs | | | $245,028 |
| 9 Vehicle Inspect.,Maint.,Repair (Supplies) | $0.16 | $/veh. mile | |
| Vehicle miles | | | 583,400 |
| Costs | | | $93,344 |
| 10 Insp., Maint., Service of Service Vehicles | $216.46 | $/peak veh | |
| Peak vehicles | | | 18 |
| Costs | | | $3,896 |
| 11 Maint. of Vehicle Control System | $653 | $/peak veh | |
| Peak vehicles | | | 18 |
| Costs | | | $11,754 |
| 12 Maint. of Fare Collection Equipt. | $112 | $/peak veh | |
| Peak vehicles | | | 18 |
| Costs | | | $2,011 |
| 13 Maint of Buildings/Grounds | $142,254 | $/garage | |
| Garage | | | 0.1 |
| Costs | | | $14,225 |
| 14 Ticketing & Fare Collection | $0.01 | $/Unl. Pass. Trip | |
| Unlinked passenger trip | | | 4,850,000 |
| Costs | | | $24,735 |
| 15 Injuries & Damages | 0.001 | $/veh mile | |
| Vehicle miles | | | 583,400 |
| Costs | | | $846 |
| 16 General Insurance | $100 | $/peak veh | |
| Peak vehicles | | | 18 |
| Costs | | | $1,800 |
| 17 Security System | $56,004 | $/garage | |
| Garage | | | 0.1 |
| Costs | | | $5,600 |
| | | | |
| **Subtotal** | | | **$1,508,486** |
| **General & Administrative (10.9%)** | | | **$164,425** |
| **Total ($1995)** | | | **$1,672,910** |
| **Total ($1998, With 3% per year Inflation)** | | | **$1,828,034** |

**TABLE A.6**
**OPERATION & MAINTENANCE COSTS FOR OPTION B: BRT - DIESEL EQUIVALENT OF 2-CAR LRT**

| Cost Component | Unit Cost | Units | Opt. B |
|---|---|---|---|
| 1 Admin & Scheduling Labor | $3.90 | $/plat hour | |
| Platform hours | | | 52,173 |
| Costs | | | $203,475 |
| 2 Oper. Wages & Fringe | $19.23 | $/plat hour | |
| Platform hours | | | 52173 |
| Costs | | | $1,003,287 |
| 3 Fuel & Labor | $0.17 | $/veh mile | |
| Vehicle miles | | | 1,295,770 |
| Costs | | | $220,280.90 |
| 4 Tubes and Tires | $2,399 | $/peak veh | |
| Peak vehicles | | | 28 |
| Costs | | | $67,180 |
| 5 Vehicle Maint. Admin Labor | $0.13 | $/veh mile | |
| Vehicle miles | | | 1,295,770 |
| Costs | | | $168,450 |
| 6 Facilities Maint. Admin Labor | $16,290 | $/garage | |
| Garage | | | 1.00 |
| Costs | | | $16,290 |
| 7 Servicing Revenue Veh. Labor | $5,276 | $/peak veh | |
| Peak vehicles | | | 28 |
| Costs | | | $147,728 |
| 8 Vehicle Inspect., Maint., Repair (Labor) | $0.42 | $/veh. mile | |
| Vehicle miles | | | 1,295,770 |
| Costs | | | $544,223 |
| 9 Vehicle Inspect.,Maint.,Repair (Supplies) | $0.16 | $/veh. mile | |
| Vehicle miles | | | 1,295,770 |
| Costs | | | $207,323 |
| 10 Insp., Maint., Service of Service Vehicles | $216.46 | $/peak veh | |
| Peak vehicles | | | 28 |
| Costs | | | $6,061 |
| 11 Maint. of Vehicle Control System | $653 | $/peak veh | |
| Peak vehicles | | | 28 |
| Costs | | | $18,284 |
| 12 Maint. of Fare Collection Equipt. | $112 | $/peak veh | |
| Peak vehicles | | | 28 |
| Costs | | | $3,128 |
| 13 Maint of Buildings/Grounds | $142,254 | $/garage | |
| Garage | | | 1.00 |
| Costs | | | $142,254 |
| 14 Ticketing & Fare Collection | $0.01 | $/Unl. Pass Trip | |
| Unlinked passenger trip | | | 4,850,000 |
| Costs | | | $24,735 |
| 15 Injuries & Damages | 0.001 | $/veh mile | |
| Vehicle miles | | | 1,295,770 |
| Costs | | | $1,879 |
| 16 General Insurance | $100 | $/peak veh | |
| Peak vehicles | | | 28 |
| Costs | | | $2,800 |
| 17 Security System | $56,004 | $/garage | |
| Garage | | | 1.00 |
| Costs | | | $56,004 |
| **Subtotal** | | | **$2,833,382** |
| **Snow Removal** | | | **$50,000** |
| **Roadway Repair** | | | **$50,000** |
| **Fare Validation / Passes** | | | **$200,000** |
| **Subtotal** | | | **$3,133,382** |
| **General & Administrative (10.9%)** | | | **$341,539** |
| **Total ($1995)** | | | **$3,474,921** |
| **Total ($1998, at 3% per year Inflation)** | | | **$3,797,140** |

## TABLE A.7
## OPERATION & MAINTENANCE COSTS FOR OPTION C: BRT - ELECTRIC TROLLEY BUS EQUIVALENT OF 2-CAR LRT

| Cost Component | Unit Cost | Units | Opt. C |
|---|---|---|---|
| 1 Admin & Scheduling Labor | $3.90 | $/plat hour | |
| Platform hours | | | 52,173 |
| Costs | | | $203,475 |
| 2 Oper. Wages & Fringe | $19.23 | $/plat hour | |
| Platform hours | | | 52173 |
| Costs | | | $1,003,287 |
| 3 Fuel & Labor | $0.00 | $/veh mile | |
| Vehicle miles | | | 1,295,770 |
| Costs | | | $0.00 |
| 4 Tubes and Tires | $2,399 | $/peak veh | |
| Peak vehicles | | | 28 |
| Costs | | | $67,180 |
| 5 Vehicle Maint. Admin Labor | $0.13 | $/veh mile | |
| Vehicle miles | | | 1,295,770 |
| Costs | | | $168,450 |
| 6 Facilities Maint. Admin Labor | $16,290 | $/garage | |
| Garage | | | 1 |
| Costs | | | $16,290 |
| 7 Servicing Revenue Veh. Labor | $5,276 | $/peak veh | |
| Peak vehicles | | | 28 |
| Costs | | | $147,728 |
| 8 Vehicle Inspect., Maint., Repair (Labor) | $0.42 | $/veh. mile | |
| Vehicle miles | | | 1,295,770 |
| Costs | | | $544,223 |
| 9 Vehicle Inspect.,Maint.,Repair (Supplies) | $0.16 | $/veh. mile | |
| Vehicle miles | | | 1,295,770 |
| Costs | | | $207,323 |
| 10 Insp., Maint., Service of Service Vehicles | $216.46 | $/peak veh | |
| Peak vehicles | | | 28 |
| Costs | | | $6,061 |
| 11 Maint. of Vehicle Control System | $653 | $/peak veh | |
| Peak vehicles | | | 28 |
| Costs | | | $18,284 |
| 12 Maint. of Fare Collection Equipt. | $112 | $/peak veh | |
| Peak vehicles | | | 28 |
| Costs | | | $3,128 |
| 13 Maint of Buildings/Grounds | $142,254 | $/garage | |
| Garage | | | 1 |
| Costs | | | $142,254 |
| 14 Ticketing & Fare Collection | $0.01 | $/Unl. Pass Trip | |
| Unlinked passenger trip | | | 4,850,000 |
| Costs | | | $24,735 |
| 15 Injuries & Damages | 0.001 | $/veh mile | |
| Vehicle miles | | | 1,295,770 |
| Costs | | | $1,879 |
| 16 General Insurance | $100 | $/peak veh | |
| Peak vehicles | | | 28 |
| Costs | | | $2,800 |
| 17 Security System | $56,004 | $/garage | |
| Garage | | | 1 |
| Costs | | | $56,004 |
| 18 Propulsion Power | $0.48 | $/veh mile | |
| Vehicle Miles | | | 1,295,770 |
| Costs | | | $621,970 |
| 19 O & M of Electric Power Facil. - Labor | $21,450 | $/route mile | |
| Dir. route miles | | | 20.8 |
| Costs | | | $446,160 |
| 20 O & M of Electric Power Facil. - Labor | $3,500 | $/route mile | |
| Dir. route miles | | | 20.8 |
| Costs | | | $72,800 |
| **Subtotal** | | | **$3,764,031** |
| **Snow Removal** | | | **$50,000** |
| **Fare Validation / Passes** | | | **$200,000** |
| **Roadway Repair** | | | **$50,000** |
| **Subtotal** | | | **$4,064,031** |
| **General & Administrative (10.9%)** | | | **$441,889** |
| **Total ($1995)** | | | **$4,495,920** |
| **Total ($1998, at 3% per year inflation)** | | | **$4,912,814** |

**TABLE A.8**
**OPERATION & MAINTENANCE COSTS FOR OPTION D: 2-CAR LRT**

| Cost Component | Unit Cost | Units | OPT. D - LRT |
|---|---|---|---|
| 1 Operator Wages and Fringes | $27.00 | $/train hour | |
| Train hours | | | 24,029 |
| Costs | | | $648,778 |
| 2 Admin and Sched. of Trans. Oper. - Labor | $14.70 | $/train hour | |
| Train hours | | | 24,029 |
| Costs | | | $353,223 |
| 3 Propulsion Power | $0.38 | $/veh mile | |
| Vehicle miles | | | 647,885 |
| Costs | | | $245,548.42 |
| 4 Insp, Maint. & Repair of Revenue Veh. | $1.93 | $/veh mile | |
| Vehicle miles | | | 647,885 |
| Costs | | | $1,250,418 |
| 5 Servicing of Revenue Vehicles - Labor | $11,584 | $/peak veh | |
| Peak vehicles | | | 14 |
| Costs | | | $162,176 |
| 6 I,M&R and Serv. of Rev. Veh - Supplies | $0.40 | $/veh mile | |
| Vehicle miles | | | 647,885 |
| Costs | | | $261,098 |
| 7 Vehicle Maint. Admin - Labor | $0.51 | $/veh mile | |
| Vehicle miles | | | 647,885 |
| Costs | | | $331,717 |
| 8 Maint. of Road and Track - Labor | $91,835 | $/dir track mile | |
| Dir. track miles | | | 20.8 |
| Costs | | | $1,910,168 |
| 9 Maint. of Vehicle Move. Cntl Syst.-Labor | $1,272 | $/dir track mile | |
| Dir. track miles | | | 20.8 |
| Costs | | | $26,458 |
| 10 Maint. of Comm Syst. - Labor | $349 | $/dir track mile | |
| Dir. track miles | | | 20.8 |
| Dir track miles | | | $7,259 |
| 11 ROW and Syst. Maint. - Supplies | $17,675 | $/dir track mile | |
| Dir. track miles | | | 20.8 |
| Costs | | | $367,640 |
| 12 O & M of Electric Power Facil. - Labor | $19,507 | $/dir track mile | |
| Dir. track miles | | | 20.8 |
| Costs | | | $405,746 |
| 13 O & M of Electric Power Facil. - Labor | $3,186 | $/dir track mile | |
| Dir. track miles | | | 20.8 |
| Costs | | | $66,269 |
| 14 Maint. & Rep. of Blds&Grds - Mat&Labor | $142,254 | $/facility | |
| Facilities | | | 0.2 |
| Costs | | | $28,451 |
| 15 Maint of Fare Coll. Equip. | $112 | $/peak veh | |
| Peak vehicles | | | 14 |
| Costs | | | $1,568 |
| 16 Maint Admin. - Facilities | $16,290 | $/facility | |
| Facilities | | | 0.2 |
| Costs | | | $3,258 |
| 17 Ticketing & Fare Collection | $0.01 | $/unl. passngr. | |
| Unlinked passengers | | | 2,958,912 |
| Costs | | | $15,090 |
| 18 Injuries and Damages | 0.0015 | $/veh miles | |
| Vehicle miles | | | 647,885 |
| Costs | | | $939 |
| 19 System Security | $56,004 | $/facility | |
| Facilities | | | 0.2 |
| Costs | | | $11,201 |
| 20 General Insurance Premiums | $100 | $/peak vehicle | |
| Peak vehicles | | | 14 |
| Costs | | | $1,400 |
| **Subtotal** | | | **$6,098,405** |
| **General & Administrative (10.9%)** | | | **$664,726** |
| **Total ($1995)** | | | **$6,763,131** |
| **Total ($1998, at 3% per year Inflation)** | | | **$7,390,256** |

PARSONS
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GROUP

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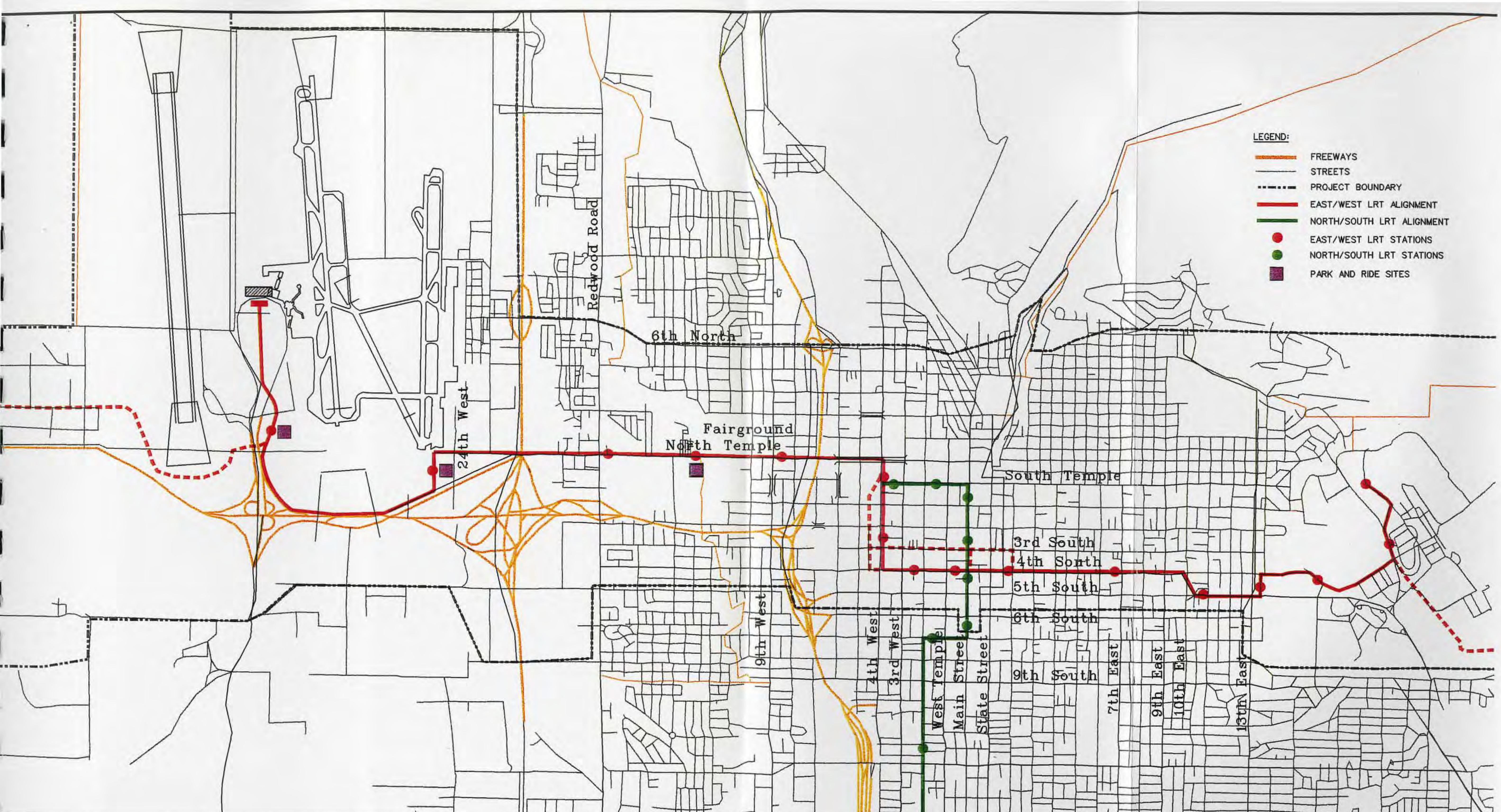


TRANSPORTATION UNIVERSITY · DOWNTOWN · AIRPORT MAJOR INVESTMENT STUDY

PARSONS TRANSPORTATION GROUP

# Options and Extensions
# Alternative C-LRT Alignment
# E/W MIS/DEIS

Figure 1

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# APPENDIX B
# EVALUATION OF LIGHT RAIL TRANSIT (LRT) ALIGNMENT OPTIONS AND EXTENSIONS

WASATCH FRONT REGIONAL COUNCIL

UTAH TRANSIT AUTHORITY

Final Environmental Impact Statement (FEIS) - Conceptual Engineering

Evaluation of Light Rail Transit (LRT) Alignment Options and Extensions

March 1998

(Revised October, 1998)

**Parsons Transportation Group**

**Airport to University West-East Corridor Study**
**Final Environmental Impact Statement (FEIS) - Conceptual Engineering**
**Evaluation of Light Rail Transit (LRT) Alignment Options and Extensions**
**March 1998**

## I. Introduction and Background

In July 1997, a Major Investment Study/Draft Environmental Impact Statement (MIS/DEIS) was completed for the West-East Corridor in Salt Lake City, Utah. The study was led by Wasatch Front Regional Council (WFRC), the region's metropolitan planning organization (MPO). As documented in the MIS/DEIS, light rail transit (LRT) was officially approved by the Federal Transit Administration (FTA), and Utah Transit Authority (UTA), as the locally preferred alternative (LPA) for the West-East Corridor. This alternative determination and approval was based upon coordination with the public, Salt Lake City, government agencies, resource and regulatory agencies and special interest groups, combined with detailed engineering and environmental analysis. The information in the DEIS was used to select the LPA for further evaluation in the Final Environmental Impact Statement (FEIS).

The West-East LRT, a two-directional LRT line, would serve the 10.9 mile corridor by beginning at the Salt Lake City International Airport, extending through the Central Business District (CBD), to the University of Utah Health Sciences Center. The West-East LRT would help improve transit reliability between major destinations within the corridor, reduce traffic congestion, improve air quality, interface with the existing and planned regional transit system, ensure minimized impacts on the natural and man-made environment, support development of a multi-modal transportation system that is convenient, accessible and flexible enough to increase capacity; and connect with service extended to new areas in the future.

The West-East alignment begins at the Salt Lake International Airport (SLCIA) (see Figure 1). The western terminus is proposed to connect with the planned SLCIA transportation center. An interim connection near existing Terminal One may be necessary since the LRT system would be constructed prior to construction of the airport transportation center. The LRT alignment generally follows existing roadways out of the airport complex, then runs along I-80 south of the airport golf course to 2500 West. From 2500 West, the alignment heads north about two blocks to North Temple Street. The LRT alignment then runs down the middle of North Temple Street to the east until 400 West, where it turns south. The LRT alignment would run down the middle of 400 West to 400 South where it travels east through downtown to 1000 East. At 1000 East, the LRT alignment follows the roadway over to 500 South as it goes up the hill. At about 1300 East, the LRT alignment turns north to 400 South, where it enters the campus of the University of Utah and follows South Campus Drive, past the stadium and Huntsman Center to Wasatch Boulevard (see Figure

1). The LRT alignment then runs along Wasatch Boulevard to Medical Drive to the eastern terminus at the University's Health Sciences Center. Seventeen (17) LRT stations are proposed throughout the route. The West-East LRT will interface with the North-South LRT at Main Street and 400 South and at 400 West/South Temple Street, where a passenger transfer between lines will be possible. Locations for possible park and ride are still being evaluated. Possible locations include 2400 West and North Temple Street and along North Temple Street near the Utah State Fairpark. A third location in the University area along Wasatch Boulevard or Foothill Drive is also being evaluated (see Figure 1).

Possible downtown alignment options and LRT extensions were addressed in the MIS/DEIS. In response to DEIS review comments, FEIS coordination meetings and recent agency input, several downtown alignment options have been developed for further evaluation. A west LRT extension to serve the International Center west of SLCIA and an east LRT extension through Research Park southeast of the University of Utah to the Pioneer Trail State Park and Hogle Zoo, have also been developed for further evaluation during the FEIS process. The purpose of this West-East LRT Alignment Options and Extensions Evaluation Report is to fully document the development, technical analysis, and evaluation results for the six downtown options, one west extension and three east extensions for the Airport to University Corridor. These evaluation results will be included as part of the FEIS document being prepared for the West-East LRT study. The evaluation report includes a discussion of the evaluation process and criteria; a description of the LRT alignment options and possible LRT extensions; an evaluation discussion of the alignment options and extensions; an environmental constraints analysis, and the evaluation results and recommendations.

## II. Evaluation Process and Criteria

The evaluation process for the West-East LRT alignment options and extensions involved the gathering of pertinent technical information about the existing natural and man-made environment. For the downtown alignment options, it was information from North Temple to 600 South and from 600 West to 1000 East. For the extensions it was information pertaining to the International Center and surrounding area (west extension) and the Research Park, This Is The Place State Park, Hogle Zoo, Red Butte Arboretum and surrounding area. Field investigations were conducted to assess the engineering feasibility, land use and urban design issues, potential traffic impacts and other design/environmental constraints and opportunities of each of the downtown options and west-east extensions being developed and studied.

The evaluation criteria for the six downtown alignment options included: LRT travel time, track length, capital cost for structures, additional track needed for downtown circulator, passenger walking coverage, intermodal connections to transit facility and North-South

LRT, exposure to auto traffic, CBD access, pedestrian access to stations bicycle amenities, construction and operational characteristics were also considered for each downtown alignment. For the west extension to the International Center, the evaluation criteria included interface with main LRT alignment and center shuttle system, service capability to center businesses, projected employment growth, engineering/environmental constraints, track length, construction costs, number of structures, exposure to auto traffic and utilities relocations. For the three east extensions, interface with transit center (with parking), service to zoo/state park, service to Research Park and Arboretum area, environmental/historic preservation, water quality and biological resources, Section 4(f), ability to extend service to Foothill Drive, grade concerns, interface with University of Utah shuttle/UTA buses and local access between Health Sciences Center and Research Park.

Each downtown alignment option and the west and east extensions were evaluated for the above criteria compared to the other options or extension alternatives, then ranked for that evaluation criteria. Each alignment option or extension was then given an overall ranking to determine the reasonableness and feasibility of the alternative. Coordination meetings were held with the Salt Lake City planning staff, SLCIA, Research Park and other stakeholders, as well as the lead agencies of UTA, FTA, and the supervising agency, WFRC, to get their input and suggestions on the evaluation process. Once the evaluation results are complete and initial alignment and extension recommendations are made by the study team, the West-East Corridor Steering Committee will be reviewing the evaluation information an concurring on the recommended LRT alignment downtown and the feasibility and appropriateness of any LRT extensions.

## III. Description of LRT Alignment Options

Six LRT alignment alternatives for downtown Salt Lake City have been evaluated in this report. The six alternatives are as follows:

- Alternative A - 400 South -400 West;
- Alternative B - 300 South - 400 West;
- Alternative C - 400 West one-way pair;
- Alternative D - 400 South - 600 West;
- Alternative E - 300 South - 600 West; and
- Alternative F - 600 West one-way pair.

These six alternatives describe different ways to provide transit service in the downtown area between the intersections of 400 South/200 East and North Temple/600 West. Figures 2 through 7 graphically display the LRT alignment features of each of the alternatives described in the following paragraphs.

Alternative A - 400 South - 400 West: The LRT alignment for Alternative A will provide two-directional LRT service in the middle of the existing roadways within its own dedicated right-of-way (ROW). This design is true for all six alternatives. Alternative A proceeds east on North Temple to 400 West, then south on 400 West past the Delta Center and Pioneer Park to 400 South. The alignment then turns east on 400 South and proceeds east to the University of Utah. In the downtown area, center platform stations are proposed for South Temple/400 West; 200 South/400 West; 400 South/200 West; 400 South/Main Street, and 400 South/200 East. An LRT transfer point for passengers to transfer to the North-South LRT system will be located at 400 West/South Temple and 400 South/Main Street (see Figure 2). Alternative A represents the same preferred alignment as discussed in the MIS/DEIS document. A downtown LRT circulator will operate during peak hours between 400 West and Main Street and 400 South and South Temple. A circulator connection is also proposed to interface with the planned Intermodal Transit Facility and 200 South/600 West (see blue lines on Figure 2).

Alternative B - 300 South - 400 West: The LRT alignment for Alternative B will proceed from North Temple Street south on 400 West to 300 South. Alternative B then turns right and proceeds east on 300 South, just north of Pioneer Park, instead of using 400 South. At 300 South/Main Street, the West-East LRT alignment would turn south on Main Street to 400 South where it would turn back east and head to the University of Utah on 400 South. LRT center-platform stations are proposed at 400 West/South Temple; 300 South/200 West; 300 South/Main Street; and 400 South/200 East. A downtown circulator is also part of this alternative. Two alignment options are being considered for Alternative B to transition from 300 South to 400 South. These two options are transitioning streets at either West Temple or at 200 East (see Figure 3).

Alternative C - 300 South/400 South/400 West one-way pair: The LRT alignment for Alternative C would provide a two-directional LRT system south on 400 West from North Temple to 400 South. At 400 South, the LRT alignment would be a single track system traveling east to Main Street. At Main Street (on 400 South) the LRT system would become double track again and proceed east on 400 South to the University of Utah. In addition, at Main Street and 300 South, the LRT system would be a single track system proceeding west to 400 West forming a one-way pair track system on 300 South and 400 South (see Figure 4). Two options also exist with Alternative C regarding transitioning the one-way pair back to a double track LRT system. The transition streets would be West Temple or 200 East. LRT center-platform stations are proposed at 400 West/South Temple; 400 South/200 West; 300 South/200 West; 400 South/Main Street; 300 South/Main Street; and 400 South/200 East (see Figure 4). A downtown circulator would also be part of this alternative and would run on 400 West, 300 South and 400 South, Main Street, and

South Temple as well as an LRT connection to the planned Intermodal Transit Facility.

<u>Alternative D - 400 South - 600 West</u>: From the airport, Alternative D proceeds on North Temple to 600 West. At 600 West, the LRT alignment would turn right, head south on 600 West, past the planned Intermodal Transit Facility to just south of 300 South. At mid-block, between 300 South and 400 South, the LRT alignment would proceed east to 400 West. On 400 West, the LRT alignment would jog south one/half block, around Pioneer Park, to 400 South. At 400 West/400 South, the LRT alignment would head east on 400 South to the University (see Figure 5). LRT center platform stations would be proposed at the Intermodal Transit Facility on 600 West; 400 South/200 West; 400 South/Main Street; and 400 South/200 East. An LRT transfer point for passengers to transfer to the North-South LRT system, will be located at 400 South/Main Street. A downtown circulator is proposed for this alternative during peak hours (see Figure 5).

<u>Alternative E - 300 South - 600 West</u>: The LRT alignment for Alternative E proceeds south on 600 West from North Temple past the planned Intermodal Transit Facility to mid-block between 300 South and 400 South, similar to Alternative D. At this mid-block location, the LRT alignment would proceed east to either Rio Grande or 400 West; the alignment would then jog one/half block north around Pioneer Park to 300 South. The LRT alignment would follow 300 South to Main Street; turn south on Main Street and proceed to 400 South; then turn east on 400 South to the University. Two transition options (LRT transition from 300 South to 400 South) exist at West Temple and 200 East as noted for other 300 South alternatives. LRT center platform stations are proposed at the planned Intermodal Transit Facility, 300 South/200 West; 300 South/Main Street; and 400 South/200 East (see Figure 6). A downtown circulator would be a part of this alternative.

<u>Alternative F - 300 South/400 South/600 West one-way-pair</u>: The LRT alignment for Alternative F would head south on 600 West pass the Intermodal Transit Facility to mid-block between 300 South and 400 South similar to the other 600 West alternatives (Alternatives D and E). At this mid-block location, the LRT alignment would head east to 400 West. At 400 West, the LRT system becomes a single track jogging south one/half block around Pioneer Park and proceeding east on 400 South to Main Street. At 400 South/Main Street, the LRT system becomes a double track system and proceeds east on 400 South to the University of Utah (see Figure 7). At 400 South/Main Street, the LRT also proceeds in the western direction on a single track by first traveling north one block on Main Street, then heading west on 300 South to 400 West, where the LRT alignment would jog south one/half block on 400 West. At this location, it would become a double track LRT system and form a one-way-pair. LRT center platform stations would be located at the planned

Intermodal Transit Facility and 400 South/200 East. Side platform stations are proposed on the single track one-way pair at 300 South/200 West; 400 South/200 West; 300 South/Main Street; and 400 South/Main Street. A downtown circulator would be a part of this alternative (see Figure 7).

Options for Intermodal Transit Facility Connections: In addition to the Intermodal Transit Facility connections mentioned for Alternatives A, B, C, D, E, and F, other options have been evaluated for connecting the West-East LRT with the planned Intermodal Transit Facility (see Figure 8). LRT alignment options have been considered along 200 South and 300 South and 500 West and 600 West with either a center platform or side platform (for single track option) LRT station at the planned Intermodal Transit Facility.

For the purposes of our discussion and this Evaluation Report, the study team chose the 600 West/200 South location for the Intermodal Transit Facility. The study team understands that several sites for the facility are being considered. This Intermodal Transit Facility would eventually accommodate Amtrak, Greyhound, local UTA buses, Commuter Rail (future) and light rail transit. Interface with this major transit center would occur during peak travel times to maximize the transit interface capabilities of the West-East LRT system.

## IV. Description of Possible LRT Extensions (West and East)

West Extension - International Center: As part of this Evaluation Report, a possible LRT extension to the International Center west of SLCIA was conducted. The LRT extension would involve the construction of about three miles of double track line and at least three LRT stations in the International Center. The LRT extension would begin at the planned hotel station on SLCIA property and would either cross over or under the airport access roadways and then extend west, north of I-80 into the International Center on Amelia Earhart Drive or Wiley Post Way. The LRT extension could extend west as far as 5600 West, or perhaps even beyond that point to the planned Bonneville Development.

East Extensions - Alternatives 1-3: Three different alternatives were developed for evaluating the feasibility of providing LRT service through the Research Park area. These alternatives are:

- Alternative 1 - Research Park;
- Alternative 2 - Foothill Drive; and
- Alternative 3 - Arboretum

All three alternatives begin at the intersection of South Campus Drive and Wasatch Boulevard. At this location, the main West-East LRT line proceeds north along Wasatch Boulevard, continues up Medical Drive to the Health Sciences Center. The three alternatives would head south at the South Campus Drive/Wasatch Boulevard location (see Figure 9).

Alignment for Alternative 1 - Research Park would head southeast on an existing side street next to Fort Douglas. The alignment would cross U.S. Army property, Red Butte Creek, the western portion of Research Park Hotel parking lot, then cross an existing street, Wakara Way, in Research Park. Once across Wakara Way, the LRT alignment would extend to the southeast and south on Arapeen Drive to Sunnyside Avenue. On Sunnyside Avenue, the LRT extension would provide service along Sunnyside Avenue, east to This Is The Place State Park and Hogle Zoo. Three center platform stations would be proposed at Wakara Way, near Matheson State Park and near Hogle Zoo. A transit station/center with parking was considered near the Matheson State Park (see Figure 9).

Alignment for Alternative 2 - The LRT extension alignment would follow existing Wasatch Boulevard, south to Foothill Drive. On Foothill Drive, the LRT alignment would be located along the east side of the street and proceed in a southeast direction to Sunnyside Avenue. At this location, the LRT extension would be constructed in the middle of Sunnyside Avenue and would provide service to the east, terminating in This Is The Place State Park and Hogle Zoo area. Two transit centers with stations and parking lots are proposed at Foothill Drive and near Hogle Zoo (see Figure 9).

Alignment for Alternative 3 - The LRT extension alignment would follow the same alignment as Alternative 1, past Fort Douglas, across U.S. Army property, Red Butte Creek, past the Research Park Hotel to Wakara Way. The LRT alignment would then turn right and run southeast on Chipeta Way past the Arboretum, then southwest back to Arapeen Drive where it then follows the same alignment as Alternative 1 to Sunnyside Avenue east, to Hogle Zoo. Center platform stations would be located at Wakara Way, Chipeta Way, Arapeen Drive, near Matheson State Park and Sunnyside Avenue at Hogle Zoo (see Figure 9).

## V. Evaluation of LRT Alignment Options and Extensions

Based upon the evaluation criteria noted in the previous section, the six downtown LRT alignments were analyzed and compared. Table 1 shows the results of the downtown alternatives analysis. Rankings were denoted in each evaluation category: Poor, Fair, Good and Excellent. As far as travel time disruption (percent of 90 degree turns), Alternative A (400 South - 400 West) provides the most efficient downtown service with only two turns. The West-East LRT connection to the planned Intermodal Transit Facility could be accessed with a transfer to either the West-East LRT or the Circulator. The ease of rider transfer between the West-East LRT and the North-South LRT, Alternatives A, B, C and F provide the best service with Alternative C incorporating three transfer station opportunities (400 West/South Temple; 400 South/Main Street; 300 South/Main Street)(see Figure 4 and Table 1).

An important evaluation criteria in the downtown alternative alignment study is the West-East LRT system exposure to auto traffic (traffic volumes and potential conflicts in turning movements). Alternative E provides the least conflicts with traffic since the alignment is located on lighter traveled streets (600 West/300 South). Alternatives B, C and F offer the best LRT/auto traffic interface with lighter traffic on 300 South. Alternatives B and E provide the best CBD access for Salt Lake City LRT riders since these alternatives use 300 South and it is only a two block walk for riders in the heart of downtown. However, the other alternatives also provide good downtown service. The pedestrian environment and station access is better on Alternatives B and E since these LRT options use 300 South and currently has less auto traffic and the street has a more pedestrian friendly, boulevard atmosphere (see Table 1).

The integration of bicycle amenities was also considered. Since there are more opportunities to incorporate a bikeway on 300 South, Alternatives B and E provide excellent potential for bicyclist/pedestrian/LRT rider integration. Alternatives A and D provide the best interchange capability regarding the West-East LRT with the North-South LRT. In addition, since LRT construction on 400 West would require the relocation of many utilities, the alternatives that use 600 West instead of 400 West would be easier to construct through this section of the LRT system (North Temple to 400 South). However, this is an engineering and construction consideration that can be resolved with careful planning (see Table 1).

Based upon the evaluation of all criteria, in addition to agency and city coordination and project team input, the alternatives that use 600 West, Alternatives D, E and F, have been eliminated from further consideration. Alternatives A, B and C, using 400 West, can service the area of the Gateway (500 West and 600 West) and the planned Intermodal Transit Facility (if and when it is constructed) by using an LRT Circulator during peak transit schedule hours. Alternatives A (400 South-400 West) and B (400 South-300 West) are the two downtown LRT alignment alternatives that have been carried forward for additional analysis and review. These two alternatives continue to be analyzed and discussed with lead agencies, UDOT, downtown stakeholders and city officials and planners.

## VI. Evaluation of Possible LRT Extensions

On the west end of the Airport to University West-East Corridor, an extension to the International Center was evaluated using the criteria mentioned previously in this report. A primary factor in the evaluation was whether a high-frequency bus shuttle could provide transit service just as or more effectively than an extension of the West-East LRT alignment. Employment projections, ridership, costs, engineering feasibility and environmental considerations all entered into the evaluation. There is a higher potential for transit ridership to the airport, related to travelers and employment than to the International Center (employment ridership only). Employment at the International Center is also more geographically spread out making a bus shuttle service to the different employment centers more effective than LRT. The extension of the LRT to the International Center would involve constructing about three miles of double track and three or four stations. This LRT construction would represent about $100 million in costs to provide LRT service to the International Center. Given the level of ridership projected for the International Center in the near future, it is not likely to justify the cost of LRT construction.

A bus shuttle service could be designed to provide more effective internal circulation within the International Center in such a way that employee walking distances to a bus stop would be considerably shorter than the walking distance to LRT stations along a single LRT corridor. For these reasons, the LRT extension to the International Center has been eliminated from further consideration. Conceptual engineering for an LRT alignment accessing the Airport will take into account a possible future connection to the International Center in the area of the planned hotel LRT station. If ridership warrants an extension in the future, LRT trains could provide shuttle service from the airport transportation center through the hotel station to the International Center at that time. The study team continues to coordinate with the business owners of the International Center.

On the east side of the West-East LRT alignment, Alternatives A, B and C, were evaluated (see Table 2 for evaluation comparison). With regard to the LRT extension interfacing with transit centers that include parking, Alternative 2 provides the best service. Both Alternatives 1 and 2 provide excellent service to Hogle Zoo and This Is The Place State Park, since the LRT lines end at this location and the Alternative 3 rouge provides a significantly more circuitous route through Research Park (see Table 2 and Figure 9). Alternative 3 does provide better service to Research Park and the Arboretum than the other two alternatives that were considered. However, the effectiveness of LRT service vs. bus shuttle service in these areas was an important consideration. When reviewing the potential environmental concerns, Alternative 2 is significantly more desirable because of the possible encroachment on Fort Douglas, a National Register of Historic Places site, and the crossing of Red Butte Creek for Alternatives A and C. Alternative 2 provides the best connection at Sunnyside Avenue and Foothill Drive as far as being able to extend service capability in the future down a major arterial corridor, i.e., Foothill Drive (see Table 2). Roadway grade concerns regarding LRT track design were not an issue for Alternatives 1 and 2 but were significant for Alternative 3 since the grade approached maximum grade recommendations.

Interface with the existing and planned University of Utah shuttle system and the existing and planned UTA bus system are better provided by either Alternatives 1 or 3. In addition, Alternatives 1 and 3 also provide better access between the University's Health Science Center and the Research Park. However, again the effectiveness of an LRT system vs. a bus shuttle service to achieve these objectives was an important consideration, especially when construction costs are considered too. Based upon the study team's evaluation of east extensions, Alternatives 1 and 3 have been eliminated from further consideration and Alternative 2 has been carried forward for further review, analysis and coordination with the lead agencies, university and SLC staff.

## VII. Environmental Constraints Analysis

As part of the detailed evaluation of downtown LRT alignments and west and east LRT extensions, an environmental constraints analysis was conducted. Base data and detailed study information that was gathered as part of the MIS/DEIS phase was used to identify key environmental issues that may affect the constructability or feasibility of the LRT alternatives being considered. Additional information was also gathered and lengthy site visits and alignment investigations were conducted as part of the alternatives screening. For each of the downtown alternatives and extension alternatives, the alignments were walked by experienced engineers and environmental planners to assess potential impacts to the natural and man-made environments.

Potential environmental constraints and opportunities were also assessed for each of the alternatives. Moreover, coordination with appropriate agencies, interest groups, downtown stakeholders and city and university staff revealed important environmental sensitivities within the West-East Corridor. For example, while evaluating alternate alignments for the east LRT extensions, Alternative 1 and Alternative 3, it became apparent that using right-of-way from Fort Douglas, a National Register site, or This Is The Place State Park, which would trigger an extensive Section 4(f) analysis, would be inappropriate. In addition, the crossing of Red Butte Creek by both of these alternatives could present significant wetland and biological resources concerns. As a result, the extension alignments described in this report are the alignments that were evaluated in greater detail and the alternate alignments noted in Figure 9 (dashed blue and orange lines) were dropped from consideration.

In essence, as part of the alternatives screening process, a "fatal flaw" analysis was conducted to ensure there were no overriding environmental issues that could not be addressed or would inhibit the study team and lead agencies' ability to get the necessary agency permits and approvals for the West-East LRT project. The environmental issues that were evaluated included historic structures and cultural resources, potential impacts to residences or businesses, socio-economics, air quality, parks and open space, aesthetics and urban design, potential neighborhood impacts, hazardous materials, ROW take, stream crossings and water and biological resources impacts. The downtown alternatives being carried forward, Alternatives A and B, and the east extension, Alternative 2, exhibit environmental issues and concerns in addition to the engineering, design, land use, and transportation considerations already noted in previous sections of the evaluation report.

## VIII. Summary of Evaluation Results and Recommendations

Preferred Downtown Alignment: One downtown alignment, Alternative A, 400 West/400 South, is being carried forward for further analysis and discussion. Input from Salt Lake City staff and officials has been received and the Salt Lake City Council approved the West-East LRT alignment on 400 West/400 South through downtown in May, 1998.

West and East Extension Conclusions: The west extension to the International Center is not being studied further. The study team will continue to coordinate with representatives of the International Center as appropriate for a possible LRT extension in the future. Alternative 2 - Foothill Drive, the LRT extension that was studied further on the east end of the corridor by the University. Coordination and discussions as to the feasibility and appropriateness of constructing this extension was accomplished. The decision was made not to construct this LRT extennsion as this area could be better served by a bus shuttle.

Recommendations to Steering Committee: Coordination meetings and discussions with SLC staff, planners, lead agencies and other downtown/corridor stakeholders were accomplished. The draft evaluation report was submitted to the Steering Committee for review and discussion; then final recommendations regarding the downtown LRT alignment and extensions were made regarding the West-East LRT alignment throughout the corridor.

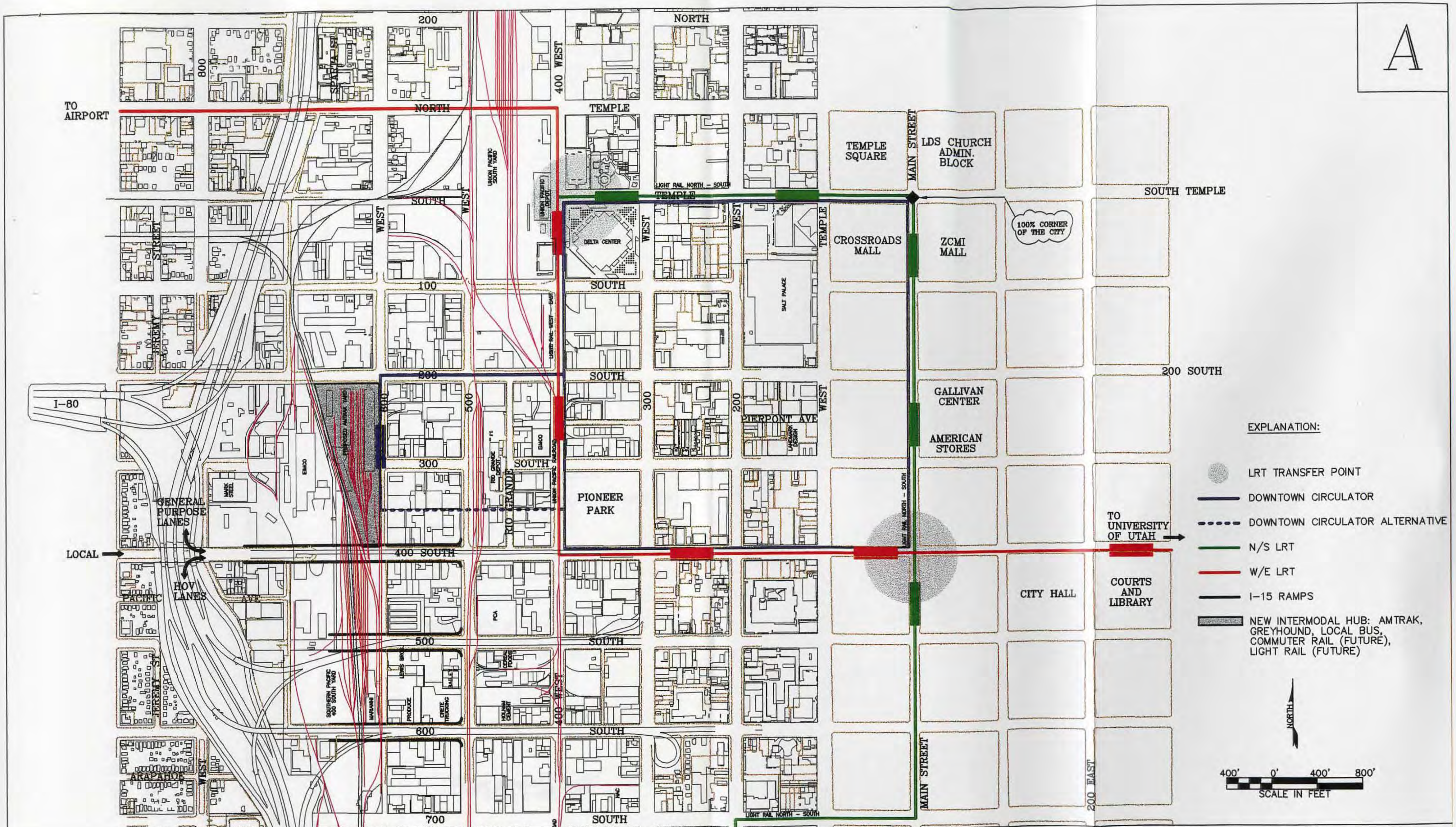
TABLE 1

| DOWNTOWN ALIGNMENT: COMPARISON OF ALTERNATIVES | | | | | | |
|---|---|---|---|---|---|---|
| Issue | Alternative A | Alternative B | Alternative C | Alternative D | Alternative E | Alternative F |
| | 400S - 400W | 300S - 400W | 400W 1-Way Pair | 400S - 600W | 300S - 600W | 600W 1-Way Pair |
| West/East Travel Time Disruption (# of 90° turns to get from 400S onto North Temple) | Excellent | Good | Fair | Good | Fair | Poor |
| | 2 turns | 4 turns | 6 turns | 4 turns | 6 turns | 7 or 8 turns |
| Total Blocks of Track between 600W & 200E (not including Circulator) | Excellent | Excellent | Good | Excellent | Excellent | Good |
| | 13 (all double track) | 13 (all double track) | 8 (dbl track) 9 (single track) | 13 (all double track) | 14 (all double track) | 8½ (dbl track) 9 (single track) |
| Capital Cost: Structures | Good | Good | Good | Fair | Fair | Fair |
| | North Temple Underpass or bridge | North Temple Underpass or bridge | North Temple Underpass or bridge | Requires separate RR Overpass | Requires separate RR Overpass | Requires separate RR Overpass |
| Circulator: Blocks of Additional Track Required | Fair | Fair | Fair | Fair | Fair | Fair |
| | 3½ - 5 blocks | 3½ - 5 blocks | 3½ - 5 blocks | 4 blocks | 4 blocks | 4 blocks |
| Downtown Walking Coverage (Assuming 2-Block Walk Ave) | Excellent | Good | Excellent | Excellent | Good | Excellent |
| | No Overlap w/ N/S - Reaches to 600S | CBD Overlaps with N/S - Reaches to 500S | Overlaps with N/S line and reaches to 600S | No Overlap w/ N/S - Reaches to 600S | CBD Overlaps with N/S - Reaches to 500S | Overlaps with N/S line and reaches to 600S |
| West/East LRT transfer stations with North/South LRT | Excellent | Excellent | Excellent | Good | Good | Excellent |
| | 2 | 2 | 3 | 1 | 1 | 2 |
| Exposure to Automobile Traffic | Poor | Good | Good | Fair | Excellent | Good |
| | 400S: Heavy 400W: Heavy | 300S: Light 400W: Heavy | 400S: 1-way; Medium 300S: 1-way; Light | 400S: Heavy 600W: Light | 300S: Light 600W: Light | 400S: 1-way; Medium 300S: 1-way; Light |

| Issue | Alternative A | Alternative B | Alternative C | Alternative D | Alternative E | Alternative F |
|---|---|---|---|---|---|---|
| | 400S - 400W | 300S - 400W | 400W 1-Way Pair | 400S - 600W | 300S - 600W | 600W 1-Way Pair |
| Walk access to the center of the CBD from West/East LRT | Good | Excellent | Good | Good | Excellent | Good |
| | 3-Block walk | 2-Block walk | 2 or 3-Block walk | 3-Block Walk | 2-Block walk | 2 or 3-Block Walk |
| Pedestrian Environment and Access to Stations | Fair | Excellent | Good | Fair | Excellent | Good |
| | 400S & 400W: Not ped. Friendly due to high traffic volumes | 300S: very ped friendly due to Blvd atmosphere with low traffic | 300S: very ped friendly 400S: Not ped. Friendly (see A) | 400S: Not ped. Friendly due to high traffic volumes | 300S: very ped friendly due to Blvd atmosphere with low traffic | 300S: very ped friendly 400S: Not ped. Friendly (see A) |
| Bicycle Amenities | Poor | Excellent | Good | Poor | Excellent | Good |
| | 400S: No room for bike lane (heavy auto traffic on 400S) | 300S: could fit a bike lane; could tie into existing east-west system | 300S: room for bike lane 400S: likely no room for bike lane | 400S: No room for bike lane (heavy auto traffic on 400S) | 300S: could fit a bike lane; could tie into existing east-west system | 300S: room for bike lane 400S: likely no room for bike lane |
| Interchange Capability: W/E line with N/S Line | Excellent | Fair | Good | Excellent | Fair | Good |
| | 2 | 2 | 3 | 1 | 1 | 2 |
| Exposure to 400W Utilities | Poor | Poor | Poor | Excellent | Excellent | Excellent |
| | Tracks in 5 blocks of 400W | Tracks in 4 blocks of 400W | Tracks in 5 blocks of 400W | Tracks in ½ block of 400W | Tracks only cross 400W | Tracks in 1 block of 400W |

TABLE 2

| RESEARCH PARK / ZOO / STATE PARK: COMPARISON OF ALTERNATIVES | | | |
|---|---|---|---|
| **Issue** | **Alternative #1: Research Park** | **Alternative #2: Foothill Drive** | **Alternative #3: Arboretum** |
| Transit Centers (with parking) | Fair | Good | Poor |
| | Need to drive to center of R. Park | Would need to be in open space area | Only at end of the line |
| Service to the Zoo / State Park | Excellent | Excellent | Fair |
| | Line would continue to Zoo/State Park | Line would continue to Zoo/State Park | Line would continue to Zoo/State Park; circuitous path |
| Service to the Research Park | Good | Fair | Excellent |
| | Moderate exposure to Research Park | Almost no exposure to Research Park | Maximum exposure to Research Park |
| Service to the Arboretum / Possible Future Museum Area | Fair | Poor | Excellent |
| | | | |
| Environmental / Historic / 4-f concerns in Research Park area | Fair | Excellent | Fair |
| | Possible encroachment on Fort Douglas; Need to cross Red Butte Creek | No glaring concerns | Possible encroachment on Fort Douglas; Need to cross Red Butte Creek |
| Ability to Extend Service Along Foothill Drive | Fair | Excellent | Poor |
| | Connection to Foothill Dr. from Sunnyside | Alignment could be extended at Sunnyside | Connection to Foothill Dr. would be awkward |
| Grade Concerns | Excellent | Excellent | Poor |
| | No serious grade concerns | No serious grade concerns | Approaches max. Recommended grade |
| Interface with U of U Shuttle System / UTA System | Excellent | Fair | Excellent |
| | | | |
| Local Access between the HSC and the Research Park | Excellent | Poor | Excellent |
| | Access to east campus and Research Park | Only peripheral access to Research Park and east campus | Access to Research Park and east campus |




**PARSONS TRANSPORTATION GROUP**

# ALTERNATIVE A

W/E LRT Downtown
400 South/400 West

Figure 2

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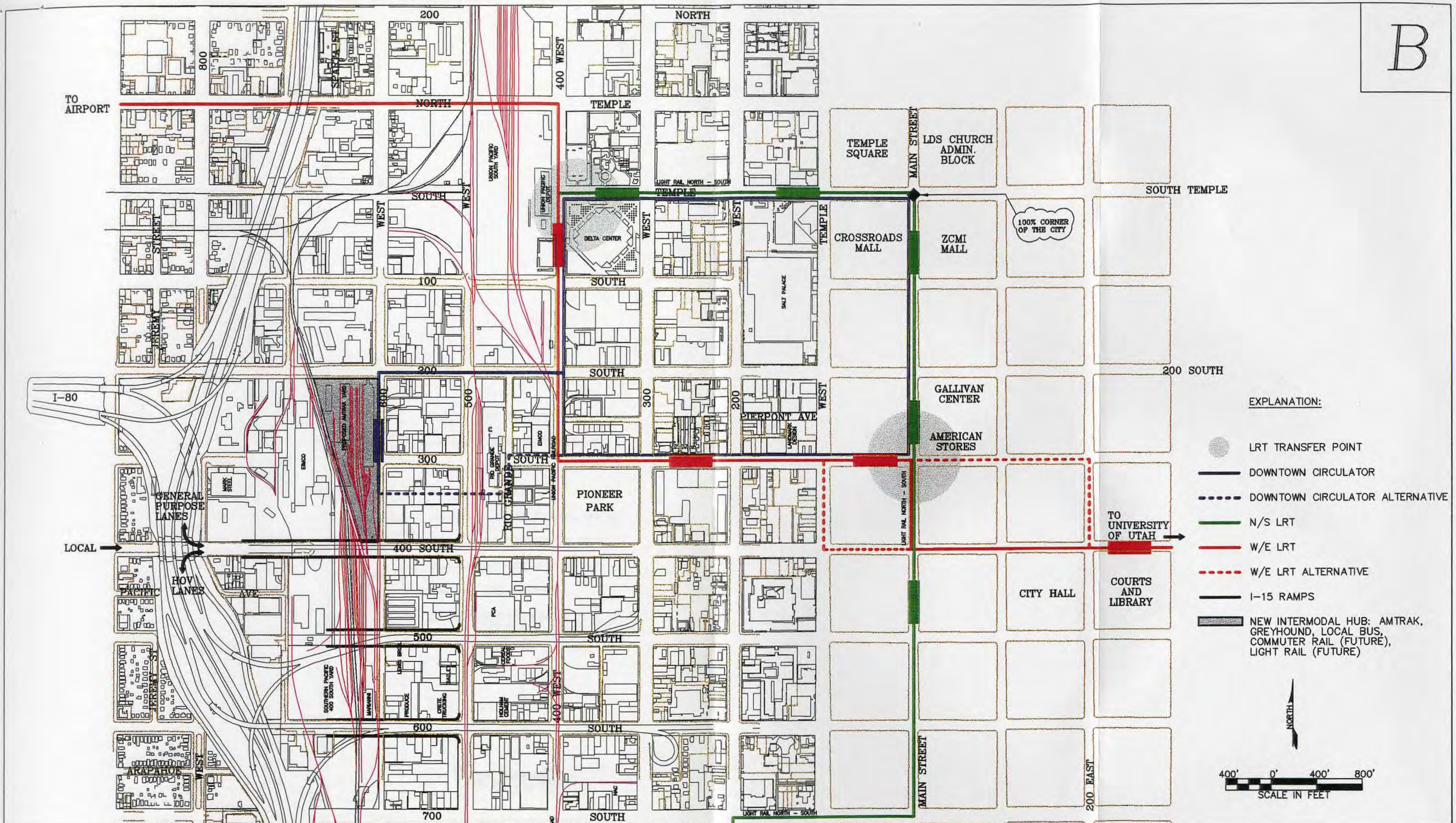


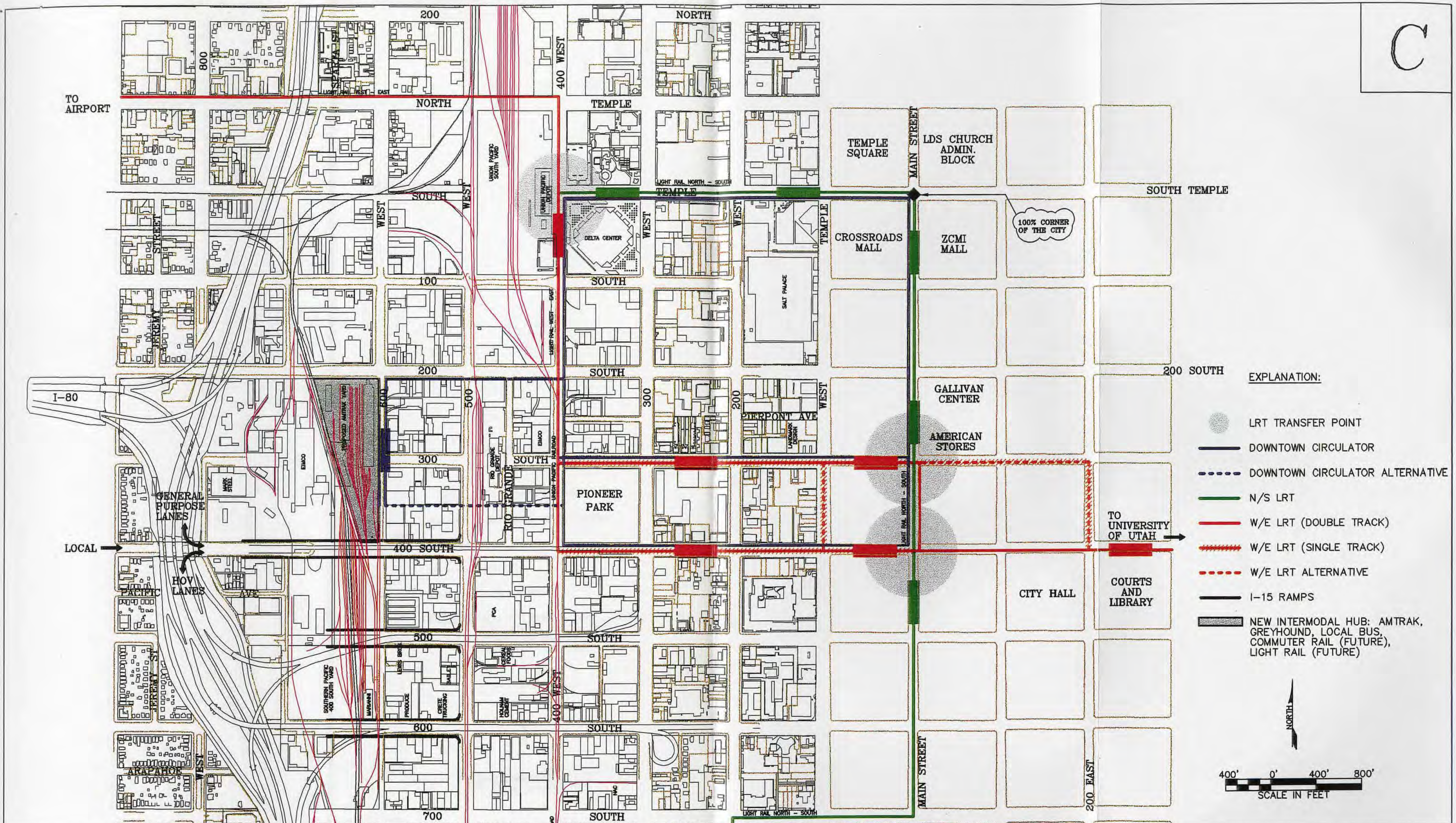

**PARSONS TRANSPORTATION GROUP**

ALTERNATIVE B

W/E LRT Downtown
300 South/400 West

Figure 3

D:\TRAX\FIGURES\WELRTOP-B.DWG R03 02.10.98




**PARSONS TRANSPORTATION GROUP**

ALTERNATIVE C

W/E LRT Downtown
300 South/400 South/400 West One-Way Pair

Figure 4

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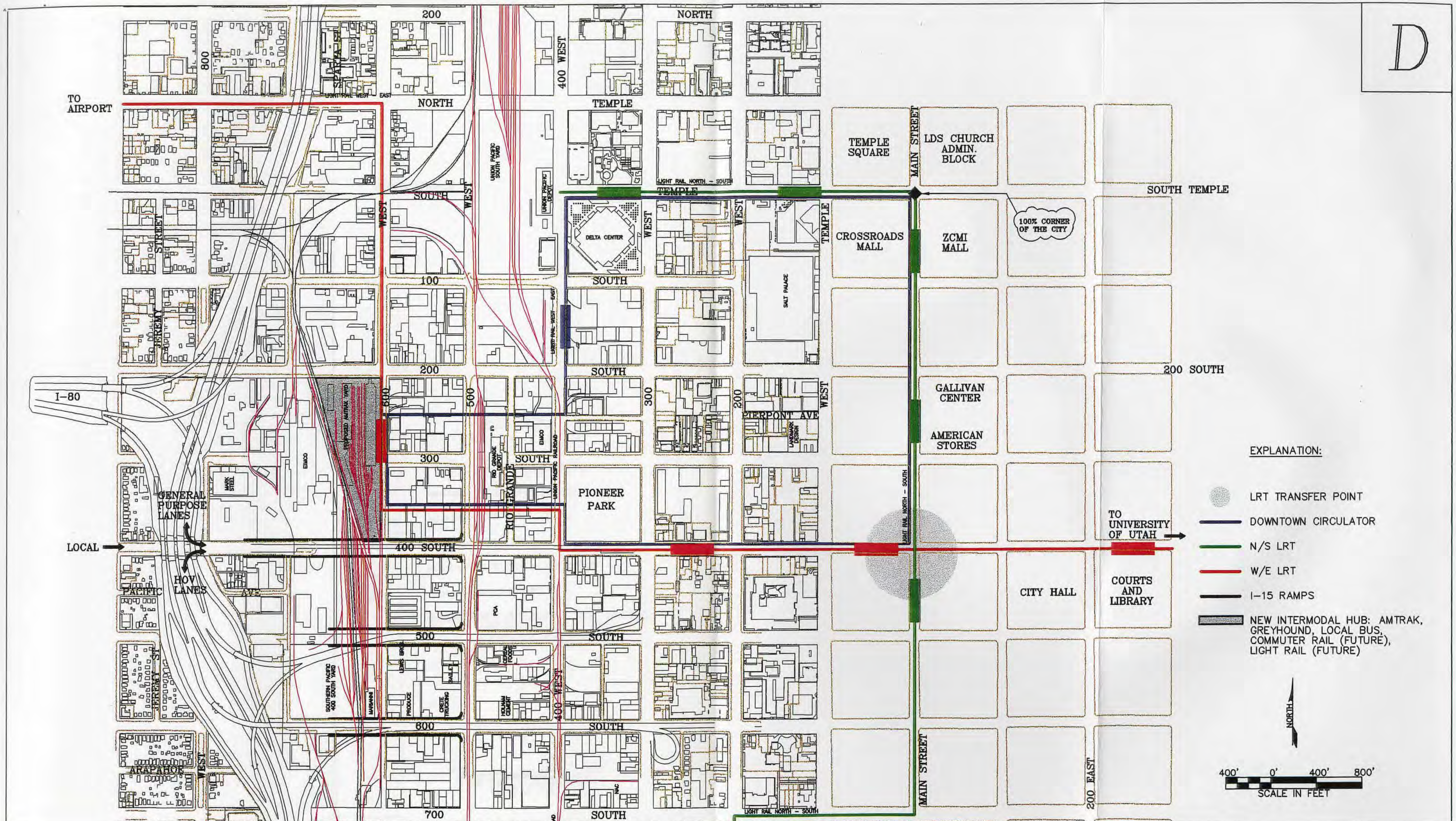


**PARSONS TRANSPORTATION GROUP**

ALTERNATIVE D

W/E LRT Downtown
400 South/600 West

Figure 5

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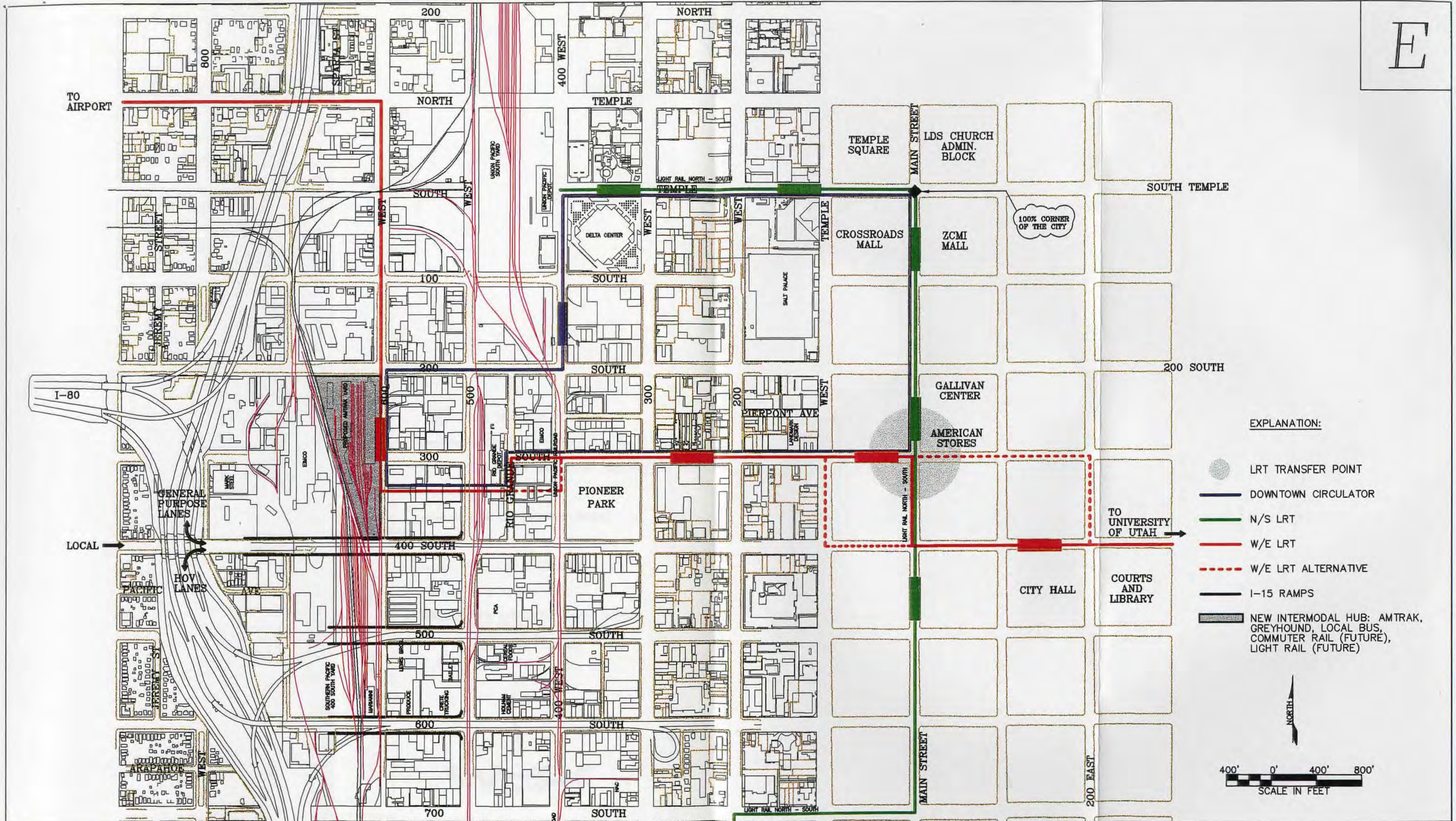


**PARSONS TRANSPORTATION GROUP**

ALTERNATIVE E

W/E LRT Downtown
300 South/600 West

Figure 6

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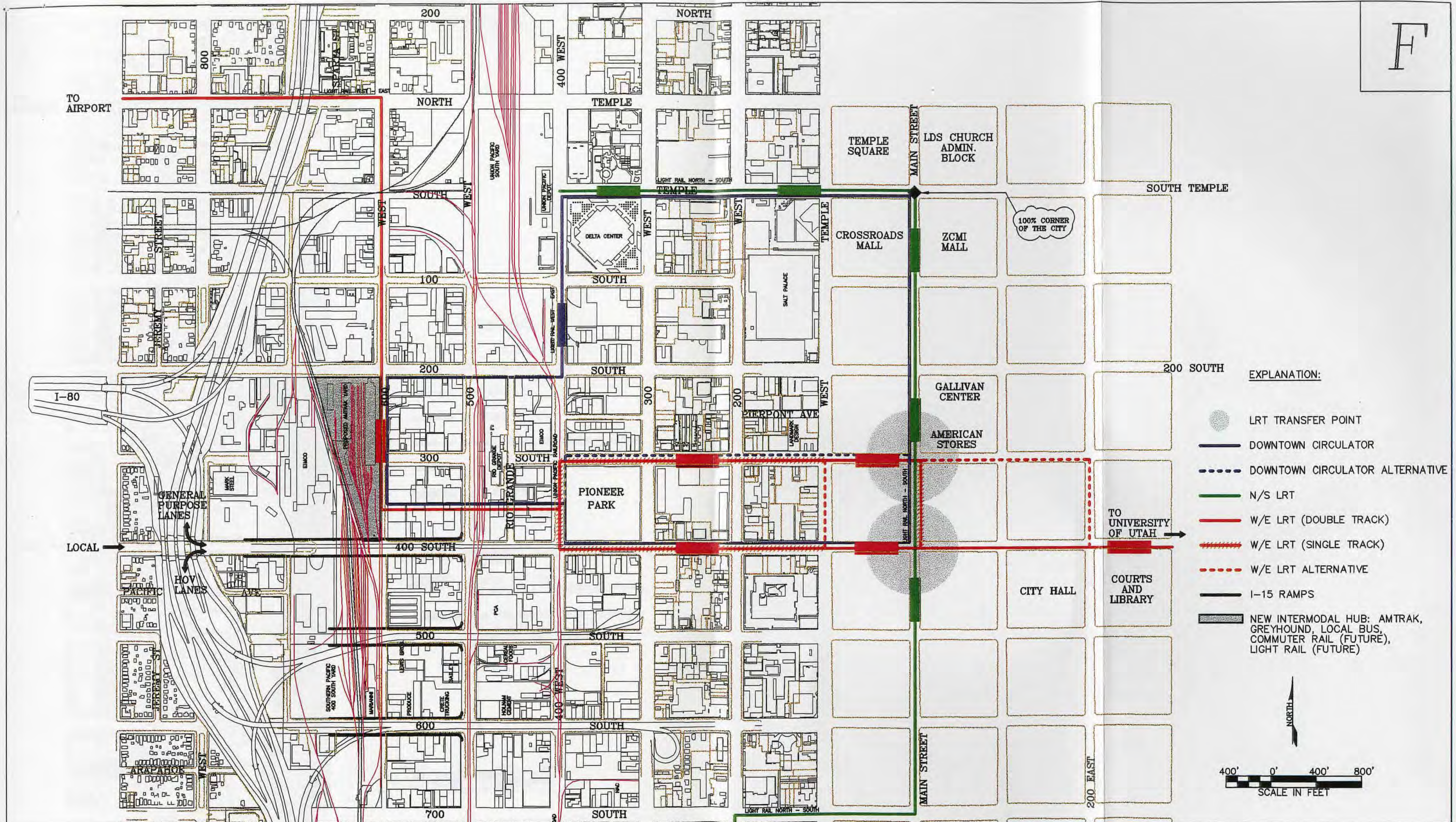


**PARSONS TRANSPORTATION GROUP**

# ALTERNATIVE F

W/E LRT Downtown

300 South/400 South/600 West One-Way Pair

Figure 7

E:\TRAX\FIGURES\WELRTOP-F.DWG R03 02.10.98


**PARSONS TRANSPORTATION GROUP**

# OPTIONS FOR INTERMODAL CONNECTION

W/E LRT Downtown
Downtown Area

Figure 8

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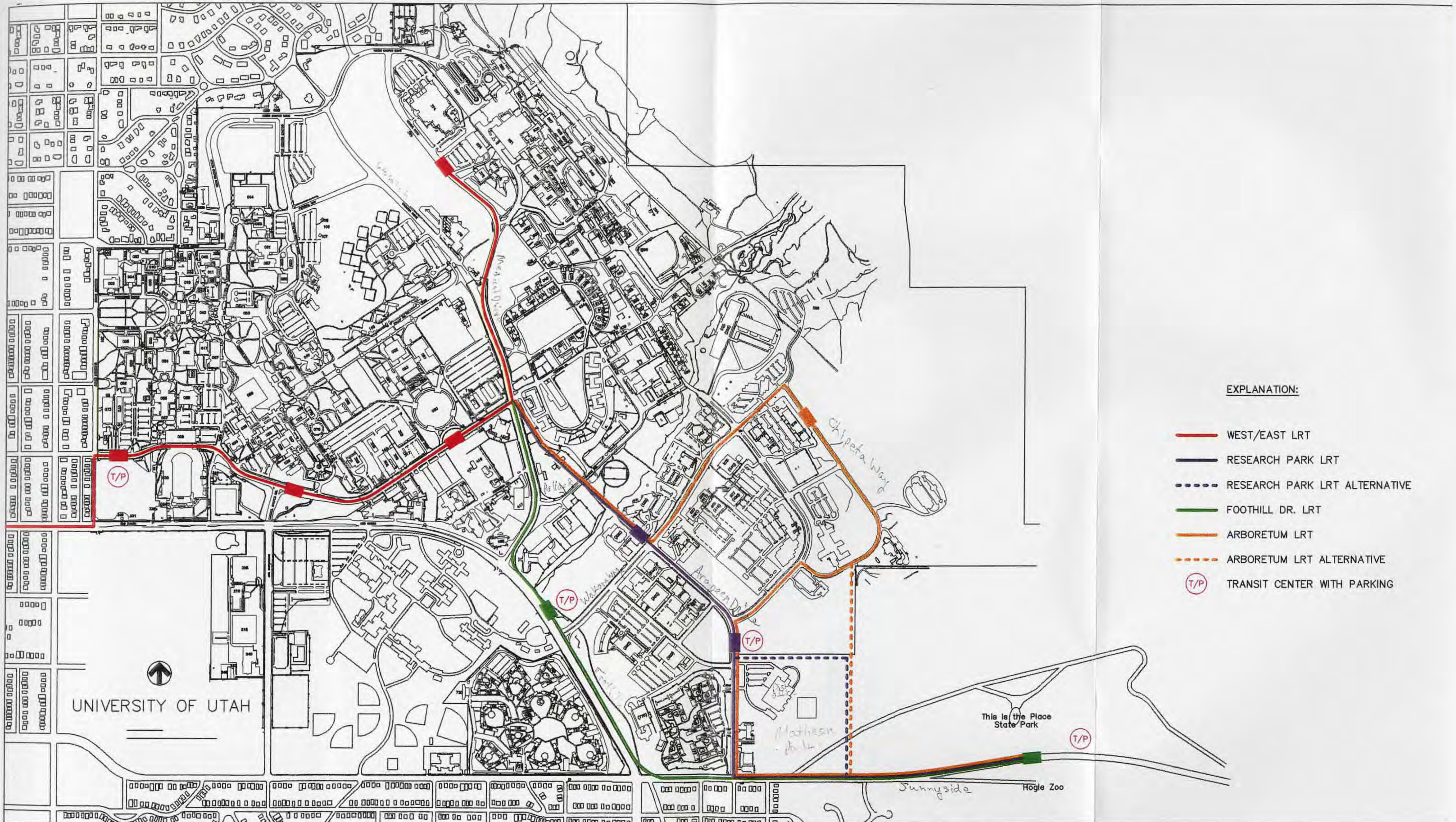


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# ALIGNMENT ALTERNATIVES

University/Research Park/
State Park/Zoo

Figure 9

D:\TRAX\FIGURES\UOFUBASE.DWG R02 02.10.98

# APPENDIX C
# WEST-EAST CORRIDOR
# WETLAND DELINEATION REPORT

# WETLAND DELINEATION REPORT

# AIRPORT TO UNIVERSITY WEST-EAST CORRIDOR

# FINAL ENVIRONMENTAL IMPACT STATEMENT

# SALT LAKE CITY, UTAH

Prepared for

WASATCH FRONT REGIONAL COUNCIL
UTAH TRANSIT AUTHORITY
Salt Lake City, Utah

Prepared by

NATURAL RESOURCES CONSULTING
Logan, Utah
PARSONS TRANSPORTATION GROUP
Salt Lake City, Utah

August 17, 1998

## INTRODUCTION

The Wasatch Front Regional Council and the Utah Transit Authority propose to construct the West/East Light Rail Transit Project to serve the Airport to University West-East Transportation Corridor of Salt Lake City, Utah. The objectives of the Light Rail Transit Project include the following: to improve transit reliability between major destinations within the corridor; to reduce traffic congestion; to interface with the existing and planned regional transit system; to assure minimal impacts on the natural and manmade environment; to support development of a multi-modal transportation system that is convenient, accessible, and flexible enough to increase capacity; and to connect with service extended to new areas in the future (WFRC & PTG 1997).

A wetland delineation was performed within the project area for the West-East Light Rail Transit Project. The project area extends from the Salt Lake International Airport located on the west side of Salt Lake City, through downtown Salt Lake City, to the University of Utah Health Sciences Center located on Medical Drive on the east side of Salt Lake City (Figure 1). Due to the primarily urban nature of the proposed transit corridor, the wetland delineation study focused on the west end of the project area. The purpose of the wetland delineation report is to identify the extent and distribution of jurisdictional wetlands and waters of the United States within the project area that could potentially be disturbed by development of the Light Rail Transit Project. With this information, unnecessary impacts to wetlands and waters of the U.S. have been avoided, the extent of unavoidable impacts to wetlands and waters of the U.S. have been evaluated, and appropriate mitigation is proposed.

In order to qualify as a jurisdictional wetland, the vegetation, soil, and hydrology of a site must meet criteria specified in the Corps of Engineers Wetlands Delineation Manual (USACE-EL 1987). The dominant plant species in the vegetation must be designated as hydrophytic according to the National List of Plant Species that Occur in Wetlands (USFWS 1988) or the 1996 Supplement to the List of Plant Species that Occur in Wetlands: Intermountain (Region 8) (Schwinn, et al. 1995). Soils must be included in the Hydric Soils of the United States (USDA-SCS 1987) for the area, be mottled or gleyed, or possess other field indicators of hydric conditions of natural origin. Similarly, the hydrology of the area under consideration must be evident in field indicators of natural wetland hydrology, such as oxidized live roots, natural wetland drainage patterns, saturated soils without irrigation, etc. If the vegetation, soils, and hydrology all meet the necessary criteria, the area is designated as a jurisdictional wetland. The limit of the jurisdiction of the U.S. Army Corps of Engineers (Corps) extends to the limit of the area that qualifies as wetland.

In order to qualify as waters of the United States, a drainage or unvegetated area must be characterized by physical features that indicate the location of an ordinary high water mark. The limit of the jurisdiction of the Corps over waters of the U.S., in the absence of adjacent wetlands, extends to the ordinary high water mark, as indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation, the presence of litter and debris, or other means appropriate to site characteristics. The presence of defined channel bed and banks in an intermittent drainage is sufficient to qualify the drainage as waters of the U.S., subject to the jurisdiction of the Corps. Unvegetated areas subject to seasonal or intermittent inundation, but surrounded by vegetation lacking substantial cover by hydrophytic plant species, have also been determined to qualify as waters of the U.S., subject to jurisdiction by the Corps.

## METHODS

The wetland delineation was performed using the criteria described in the Corps of Engineers Wetlands Delineation Manual (USACE-EL 1987). Short transects were established perpendicular to the perimeter of concave basins or areas of open water. Sample sites were located along these transects within vegetation types or topographic features with the potential to qualify as jurisdictional wetlands. The locations of the areas sampled are illustrated in Figure 2. Sampling procedures are described as follows:

**Vegetation** - Ocular estimates of areal cover by vegetation were made to determine the dominant plant species in each vegetation stratum within a five foot radius of each sample location. Plant species were assigned the appropriate indicator status from the National List of Plant Species that Occur in Wetlands (USFWS 1988) or the 1995 Supplement to the List of Plant Species that Occur in Wetlands: Intermountain (Region 8) (Schwinn, et al. 1995). Where the plant species present were not identifiable due to the phenological stage of the vegetation at the time of sampling, the ranges of indicator status for the genera were assigned or the indicator status was designated as unknown. Species that were not included in the National List were designated as NL for not listed.

**Soils** - Soil pits at least 18 inches deep were dug at all sample sites with the potential to include jurisdictional wetlands using a shovel. Soils were inspected for mottling, gleying, or other evidence of hydric conditions. Where field observations of soil conditions at a specific site did not agree with designation of the soil type at that site as hydric, the field observations were considered to be more representative of actual conditions at the site than the general designation.

**Hydrology** - The soils, topography, and surface conditions at each site were inspected for field indicators of natural wetland hydrology.

Data regarding vegetation, soil, and hydrologic conditions were recorded onto data sheets which are included in Appendix A of this report. Using the data collected, wetland determinations were made for each vegetation type according to guidelines in the Corps of Engineers Wetlands Delineation Manual (USACE-EL 1987). Determinations of areas qualifying as waters of the U.S. were also made from field observations.

The boundaries of areas determined to qualify as jurisdictional wetlands were flagged in the field following verification of the delineation by a representative of the Corps. The boundaries were surveyed and survey data were used to generate Figure 2 included in this report.

## PROJECT AREA DESCRIPTION

The West-East Light Rail Transit Project area extends from the Salt Lake City International Airport, through the downtown business district of Salt Lake City, to the University of Utah Health Sciences Center. The project area consists of a corridor within which the construction of a Light Rail Transit (LRT) system is proposed. Between the Salt Lake City International Airport and the west end of North Temple, the proposed transit corridor is located in open fields and within the Utah Department of Transportation's (UDOT) right-of-way adjacent to the access road to the airport from Interstate Highways 215 and 80. Between the west end of North Temple at approximately 2500 West and the west end of South Campus Drive, as well as along South Campus Drive to the east of the new stadium on the University of Utah campus, the proposed transit corridor is located in the middle of existing streets with no potential for jurisdictional wetlands or waters of the U.S. Along South Campus Drive from the west edge of the campus to east of the Huntsman Center, the LRT alignment is located on the north side of the street, than it runs north along Wasatch Boulevard in the vicinity of the University of Utah and Fort Douglas. The proposed LRT corridor here includes landscaped areas along Wasatch Boulevard and Medical Drive, with no potential areas of jurisdictional wetlands or waters of the U.S. (Figure 1). The wetland delineation study focused on the open fields and the highway right-of-way on the west end of the project area because they include areas with the potential to qualify as jurisdictional wetlands or waters of the U.S.

The final width of potential disturbance had not been determined at the time of field data collection for the wetland delineation. As a result, the area evaluated for the presence of jurisdictional wetlands or waters of the U.S. within the highway right-of-way extended from the toe of the road fill associated with the airport access road and the fence delimiting the edge of the Wing Pointe Golf Course. On the west end of the proposed transit corridor where it enters the Salt Lake City International Airport property, the final alignment of the transit project had also not been determined at the time of field data collection for the wetland delineation. A hotel complex on airport property is planned for this area as a separate project. However, the proposed transit corridor would be located within a zone 50 feet wide adjacent to the airport access road to the point where the first exit ramp diverges from the airport access road. This zone was evaluated for the presence of areas with the potential to qualify as jurisdictional wetlands or waters of the U.S. Beyond the point of divergence of the first exit ramp from the airport access road, it was assumed that the proposed transit corridor would be located within the landscaped areas associated with airport facilities, which include no areas with the potential to qualify as jurisdictional wetlands or waters of the U.S.

## RESULTS AND DISCUSSION

Jurisdictional wetlands and waters of the U.S. were identified within the proposed transit corridor between the west end of North Temple and the Salt Lake City International Airport (Figure 2). Jurisdictional wetlands within the project area include a shallowly concave area subject to runoff from surrounding filled areas near the west end of North Temple and a nearly continuous linear area along the airport access road between the two bridges over the Surplus Canal. Waters of the U.S. include shallow, unvegetated open water areas and other unvegetated areas subject to seasonal and intermittent inundation adjacent to the airport access road to the north of the western bridge over the Surplus Canal (Figure 2).

### Extent of Jurisdictional Wetlands and Waters of the United States

The shallowly concave jurisdictional wetland area near the west end of North Temple was observed to be inundated by snowmelt and runoff for several weeks during the early spring (March and April). At the time of field data collection in early May, only the lowest portions of the concave area remained saturated to the soil surface, but evidence of earlier inundation was observed in the algal crusts and matted litter comprising as much as 40% of the surface cover. The area designated as jurisdictional wetland is surrounded by areas subject to the past deposition of up to two feet of fill material, from which it is apparent that surface runoff accumulates within the unfilled, concave area. From these observations, it is apparent that, under current conditions including the surrounding filled areas, the area designated as jurisdictional wetland is subject to hydrologic conditions adequate to qualify as wetland hydrology at least seasonally.

Observations of soil conditions also suggest that the area designated as jurisdictional wetland near the west end of North Temple is subject to inundation due to precipitation and surface runoff. Soils were observed to be saturated and gleyed only within the surface layer. A strong odor reminiscent of landfill conditions was also noted in association with the surface soil. Subsoil layers were observed to be not saturated, with a redder chroma and a coarser texture that more closely resembles the texture of the native soil type indicated on the soil map for the area (USDA-SCS 1974). These observations suggest that a relatively fine-textured soil (or fill) layer on the surface of the area designated as jurisdictional wetland is adequate to induce ponding seasonally and intermittently in association with precipitation events, with augmentation by surface runoff from the surrounding filled areas.

The area qualifying as jurisdictional wetland near the west end of North Temple that is depicted in Figure 2 includes the area supporting a canopy dominated by hydrophytic plant species, including foxtail barley (*Hordeum jubatum*), saltgrass (*Distichlis spicata*), and curly dock (*Rumex crispus*). The type of wetland represented within the area designated as jurisdictional wetland near the west end of North Temple is wet meadow, which is classified by Cowardin, et al. (1979) as palustrine persistent emergent wetland. It is anticipated that direct and indirect impacts of the proposed transit project will result in the elimination of the entire wetland area in this location.

The remaining area with the West-East Light Rail Transit Project corridor between the west end of North Temple and the eastern bridge over the Surplus Canal supports relatively weedy upland vegetation and vegetation planted by the UDOT within the highway right-of-way. It is apparent that most or all of this remaining area has been filled in the past.

Between the two bridges over the Surplus Canal, most of the UDOT right-of-way between the toe of the airport access road fill and the fence delimiting the edge of the Wing Pointe Golf Course qualifies as jurisdictional wetland or waters of the U.S. (Figure 2). The types of wetland represented within the delineated area along the airport access road include wet meadow and marsh, both of which are classified by Cowardin, et al. (1979) as palustrine persistent emergent wetland. The wet meadow portions of the jurisdictional wetland area are dominated by saltgrass (*Distichlis spicata*), with small stands of wiregrass (*Juncus arcticus*) and creeping spikerush (*Eleocharis palustris*) located in slightly wetter sites within the wetland. Portions of the wet meadow wetland area are dominated by dense stands of common reed (*Phragmites australis*), which have spread into adjacent upland areas in some locations via vegetative reproduction. The marsh portions of the jurisdictional wetland area are dominated by cattail (*Typha latifolia*), with widespread invasion by common reed and small patches of Olney threesquare (*Scirpus americanus*). The extent of areas occupied by wet meadow, marsh, and wetland common reed stands that are located within the proposed alignment for the Light Rail Transit Project between the two bridges over the Surplus Canal includes 1.95 acres, 0.31 acre, and 0.93 acre, respectively (Figure 2). It is anticipated, however, that the entire area between the fence and the toe of the road fill will be directly or indirectly impacted by the project, resulting in impacts to 3.1 acres, 0.55 acre, and 1.24 acres of wet meadow, marsh, and common reed stands, respectively.

A total of 0.69 acre within the proposed transit corridor is occupied by shallow open water for most of the year without macrophytic vegetation. This area is classified by Cowardin, et al. (1979) as palustrine aquatic bed or palustrine unconsolidated bottom wetlands (Figure 2). Vegetation cover in this area consists of mats of filamentous algae or is nonexistent. Because the open water and aquatic bed areas lack macrophyte cover and do not appear to be in the process of developing macrophyte cover, they do not qualify as jurisdictional wetlands but are regulated by the Corps as waters of the U.S. Construction of the Light Rail Transit Project will result in the filling of the smaller of the open water areas in its entirety and in the discharge of fill along the southern edge of the larger open water area (Figure 2).

Soils within the area designated as jurisdictional wetland between the two bridges over the Surplus Canal exhibit various types of evidence of past deposition of fill material. In the central portion of the wetland area, soil textures including cobble, gravel, and coarse sand indicate that road base or other fill material has been deposited within the right-of-way or has migrated from the adjacent road fill. At most sample locations characterized by such coarse soil textures, indicators of hydric soil conditions were absent despite the dominance of the vegetation by hydrophytic plant species and indicators of wetland hydrology (sample locations #7, #8, #9, #10, #11, #12, and #13). Near the east and northwest ends of the area designated as jurisdictional wetland between the bridges over the Surplus Canal, however, evidence of fill deposition was absent but indicators of hydric soil conditions were present (sample locations #3, #4, #5, and #14). From these observations of relatively undisturbed sites near the east and northwest ends of the wetland area, it was determined that all areas within the highway right-of-way that are dominated by saltgrass are characterized by hydric soil conditions, even though indicators of those hydric conditions may not have developed within the central areas which have been altered or filled.

Because the right-of-way adjacent to the airport access road between the two bridges over the Surplus Canal is concave and lower than the road surface, it is apparent that runoff from the road surface accumulates within the right-of-way. In addition, the elevation of the water surface in the Surplus Canal is higher than the surface elevation within the right-of-way. Seepage from the canal is apparently a source of additional water to the plant communities within the right-of-way, particularly in areas where the canal alignment is located close to the right-of-way. Evidence of wetland hydrology, including oxidized rhizospheres and saturated soils, was observed at most of the sample locations within the right-of-way west of the eastern bridge over the Surplus Canal.

Areas within the right-of-way between the two bridges over the Surplus Canal that were not designated as jurisdictional wetlands are occupied by several feet of fill material. Vegetation supported by these areas of fill is dominated by upland weeds, including whitetop (*Cardaria draba*), alfalfa (*Medicago *sativa*), cheatgrass (*Bromus tectorum*), and barley (*Hordeum leporinum*, *H. geniculatum*), except in the vicinity of sprinklers on the golf course.

North of the point at which the proposed transit corridor crosses the Surplus Canal for the second time, areas of unvegetated playa have been determined to qualify as waters of the U.S. These areas are seasonally and intermittently inundated by precipitation events and support a few scattered individuals of Nuttall alkaligrass (*Puccinellia nuttalliana*) and pickleweed (*Salicornia europaea*). The surrounding areas are vegetated with Mediterranean barley (*Hordeum geniculatum*), cheatgrass, six-weeks fescue (*Vulpia octoflora*), and other upland plant species. Due to the absence of hydrophytic vegetation associated with the unvegetated patches, they have been designated as waters of the U.S. instead of jurisdictional wetlands. The proposed corridor for the Light Rail Transit Project is located entirely within weedy upland areas adjacent to the unvegetated playas, so no impact to the playas is anticipated.

**Wetland Functions and Values**

The jurisdictional wetlands and waters of the U.S. located within the project area for the West-East Light Rail Transit Project provide a variety of functions and values associated with wildlife habitat and water quality. Most of the wetland areas and waters of the U.S. are located in concave areas that collect runoff from adjacent upland areas during snow melt and after precipitation events. During drier portions of the year, it is likely that water collecting in these concave areas infiltrates and performs a groundwater recharge function, except for in the wet meadow area located near the west end of North Temple which is characterized by high clay content in the surface soil which apparently isolates ponded water on the surface from the subsoil. During wetter portions of the year when the water table is high, it is likely that groundwater discharge occurs in at least some of the wetland and open water areas between the two bridges over the Surplus Canal to supplement surface runoff into these areas. Through the retention and storage of runoff within areas qualifying as wetlands or waters of the U.S., flood flows to adjacent areas are attenuated or eliminated. Because the main source of water to the wetlands and waters of the U.S. throughout the year is surface runoff from roadways, urban areas, and other filled areas, the wetlands and water of the U.S. perform water quality improvement functions, such as sediment/toxicant retention and nutrient removal/transformation. The value of the water quality improvement and flood flow attenuation functions to the overall watershed is limited, however, by the hydrologic isolation of the wetlands and waters of the U.S. within the project area.

With respect to wildlife habitat value, the habitat areas including and adjacent to the project area contribute very little to the population viability of any wildlife species in the Salt Lake Valley. On a local scale, however, the areas qualifying as wetlands or waters of the U.S. are the most valuable habitats within the project area and they enhance the value of adjacent uplands. In turn, the open spaces provided by the adjacent upland areas enhance the value of the wetlands and waters of the U.S. In addition, the small areas of unvegetated playa located where the transit project enters airport property provide limited seasonal foraging areas for a variety of shorebirds during periods of inundation. Despite their potential habitat value, these wetland areas and waters of the U.S. are relatively small and appear to be subject to fluctuating water levels which reduce their value for wildlife. Habitat value is also reduced in the wetland areas, waters of the U.S., and adjacent upland areas by the proximity of roads subject to high traffic volumes and by regular mowing by road maintenance crews.

**Anticipated Project Impacts to Jurisdictional Wetlands**

The total area of wetland located within the area that will be subject to direct and indirect impacts of the proposed Light Rail Transit Project, as proposed, includes 4.89 acres (Figure 2). Impact acreage by wetland type includes 3.1 acres of wet meadow, 0.55 acre of marsh, and 1.24 acres of common reed stands that qualify as jurisdictional wetlands. The total area qualifying as waters of the U.S. that will be subject to impacts of the proposed transit project, includes 0.69 acre of unvegetated open water. These areas include all wetlands and water of the U.S. located between the fence separating the road right-of-way from the golf course and the toe of the road fill. Although the fill required for the proposed light rail transit project does not have to be wider than 32 feet, it was assumed that any wetland areas remaining between the toe of the highway fill and the toe of the light rail fill upon completion of construction would be sufficiently affected by indirect impacts to be considered devoid of function or value. Direct impacts to wetlands are anticipated to include the discharge of fill material, conversion to project facilities, conversion to landscaped upland vegetation, etc. Indirect impacts to wetlands are anticipated to include disruption of hydrology, increased proximity to human disturbance, etc.

**Analysis of Project Alternatives**

Alternatives to the proposed alignment of the West-East Light Rail Transit Project have been analyzed as part of the transportation planning process for the Wasatch Front. Results of those analyses are reported in the Major Investment Study/Draft Environmental Impact Statement, University-Downtown-Airport Transportation Corridor, Salt Lake City, Utah prepared for the U.S. Department of Transportation, Federal Transit Administration and the Utah Transit Authority (WFRC/PTG 1997). Based on the results of the analyses, the corridor along the airport access road, North Temple, 400 West, 400/500/400 South, South Campus Drive, Wasatch Boulevard, and Medical Drive has been identified as the preferred alignment for the light rail transit (LRT) system, the locally preferred alternative.

Within the corridor proposed by the Major Investment Study/Draft Environmental Impact Statement for the light rail transit project, alternatives were considered to avoid or minimize impacts to jurisdictional wetlands. It was proposed that the light rail tracks be installed adjacent to the existing shoulder of the airport access road to take advantage of existing fill and, thus, minimize the need for discharge of additional fill into wetlands along the road. This alternative alignment was determined to be infeasible due to future plans by the UDOT to add additional traffic lanes to the road. To accommodate those plans, the alignment of the proposed light rail project must be located adjacent to the fence separating the road right-of-way from the Wingpointe Golf Course.

The feasibility of avoiding the wet meadow wetland near the west end of North Temple by confining the proposed light rail alignment to the adjacent existing fill was also considered. This alternative was considered to be undesirable due to the resulting proximity of the alignment to existing office buildings and the sharp turning radius required to avoid the wetland. Taking into consideration the relatively marginal condition of the wetland and its low potential to provide significant wetland functions and values, this alternative alignment was rejected in favor of filling the wetland and providing compensatory mitigation for the wetland loss.

**Proposed Compensatory Mitigation for Impacts to Jurisdictional Wetlands**

The jurisdictional wetlands to be affected by the proposed West-East Light Rail Transit Project are located within the service area of the Inland Sea Shorebird Reserve Bank located west of the Salt Lake City International Airport in Salt Lake County. It is proposed that compensatory mitigation for impacts to wetlands by the proposed transit project be provided by the purchase of an appropriate quantity of mitigation credits from the Inland Sea Shorebird Reserve Bank, as specified by the wetland mitigation banking agreement with the U.S. Army Corps of Engineers. Preliminary discussions with the Corps and the sponsors of the wetland mitigation bank indicate that such a purchase will be feasible. Finalization of the purchase of adequate mitigation credits to compensate for wetland impacts of the proposed transit project will be required prior to initiation of construction as a condition of the 404 permit.

**SUMMARY**

The Wasatch Front Regional Council proposes to develop the West-East Light Rail Transit Project to serve the Airport to University West-East Transportation Corridor of Salt Lake City, Utah. A wetland delineation was performed within the project area, which extends from the Salt Lake International Airport located on the west side of Salt Lake City, through downtown Salt Lake City, to the University of Utah Health Sciences Center located on Medical Drive on the east side of Salt Lake City, Utah.

Jurisdictional wetlands and waters of the U.S. were identified within the proposed transit corridor between the west end of North Temple and the Salt Lake City International Airport (Figure 2). Jurisdictional wetlands within the project area include a wet meadow wetland within a shallowly concave area subject to runoff from surrounding filled areas near the west end of North Temple. Other jurisdictional wetlands include areas of wet meadow , marsh, and shallow open water within a nearly continuous linear area along the airport access road between the two bridges over the Surplus Canal. Waters of the U.S. include unvegetated open water areas and unvegetated areas subject to seasonal and intermittent inundation adjacent to the airport access road to the north of the western bridge over the Surplus Canal. The total area of jurisdictional wetlands that will be subject to direct impacts of construction of the Light Rail Transit Project includes 4.89 acres, of which 3.1acres are wet meadow, 0.55 acre is marsh, and 1.24 acres supports stands of common reed. Compensatory mitigation for project impacts to wetlands will be provided by the acquisition of an appropriate quantity of credits from a wetland mitigation bank.

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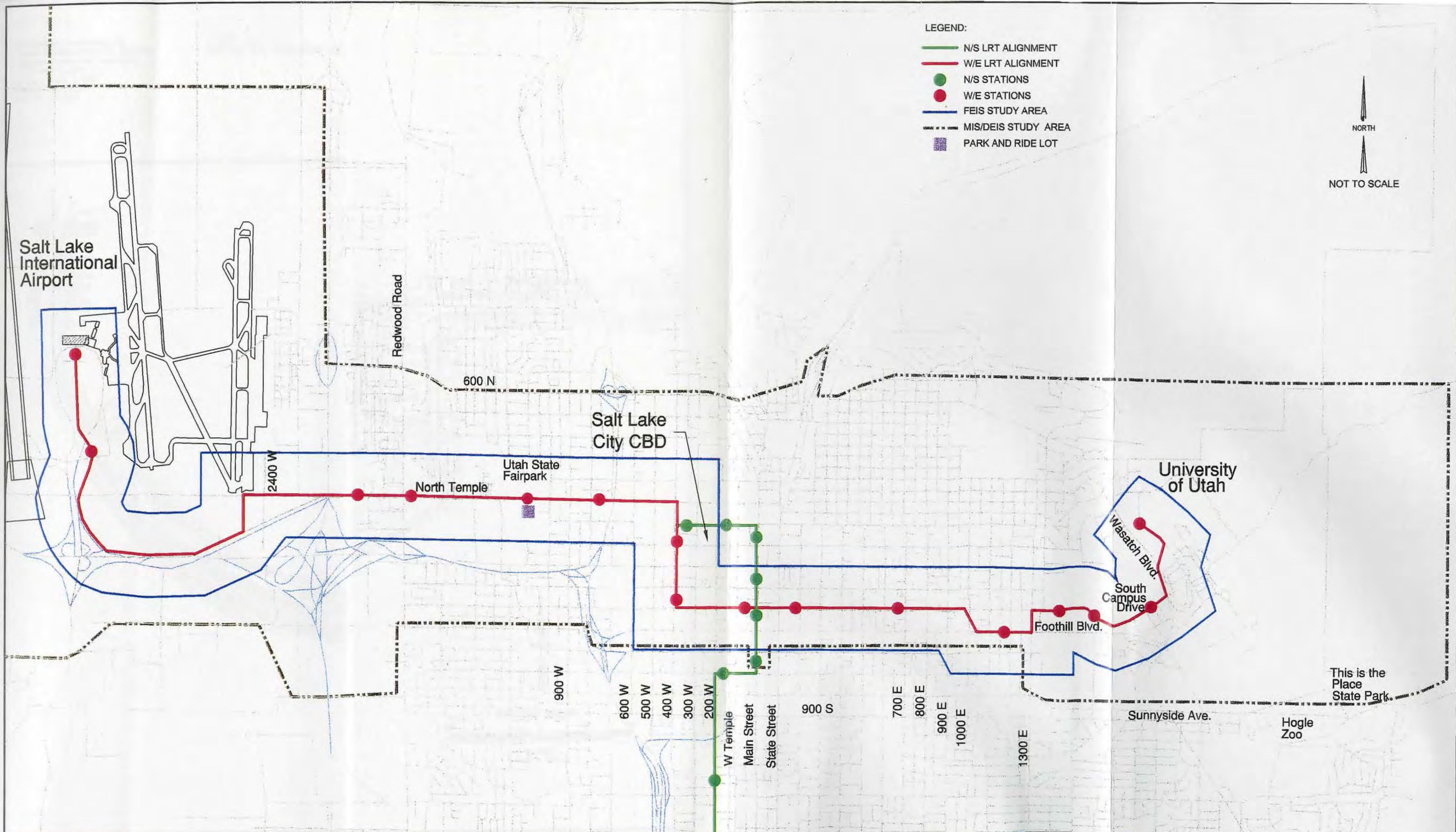
# APPENDIX A

# FIGURES

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UTA TRAX TRANSIT EXPRESS

# West-East LRT FEIS Study Corridor

Figure 1

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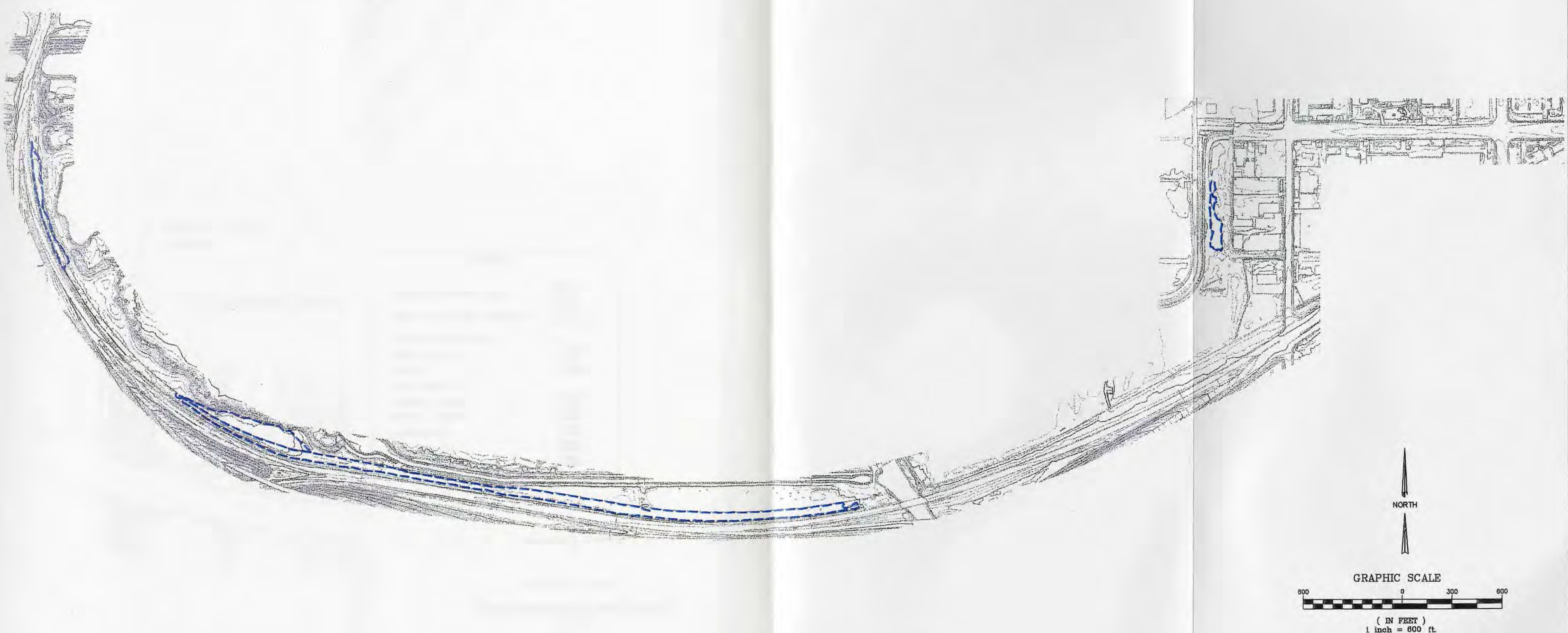
Delineation Conducted By:
Cindy Johnson/Ramona Rukavina
Natural Resources Consulting
135 East Center
Logan, Utah 84321
(435) 752-4200
5/7 - 5/8/98

Property Owner:
Salt Lake City International Airport




AIRPORT TO UNIVERSITY
WEST - EAST CORRIDOR
LIGHT RAIL TRANSIT

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West-East LRT FEIS
Wetlands in Study Corridor

Figure 2

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Delineation Conducted By:
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Natural Resources Consulting
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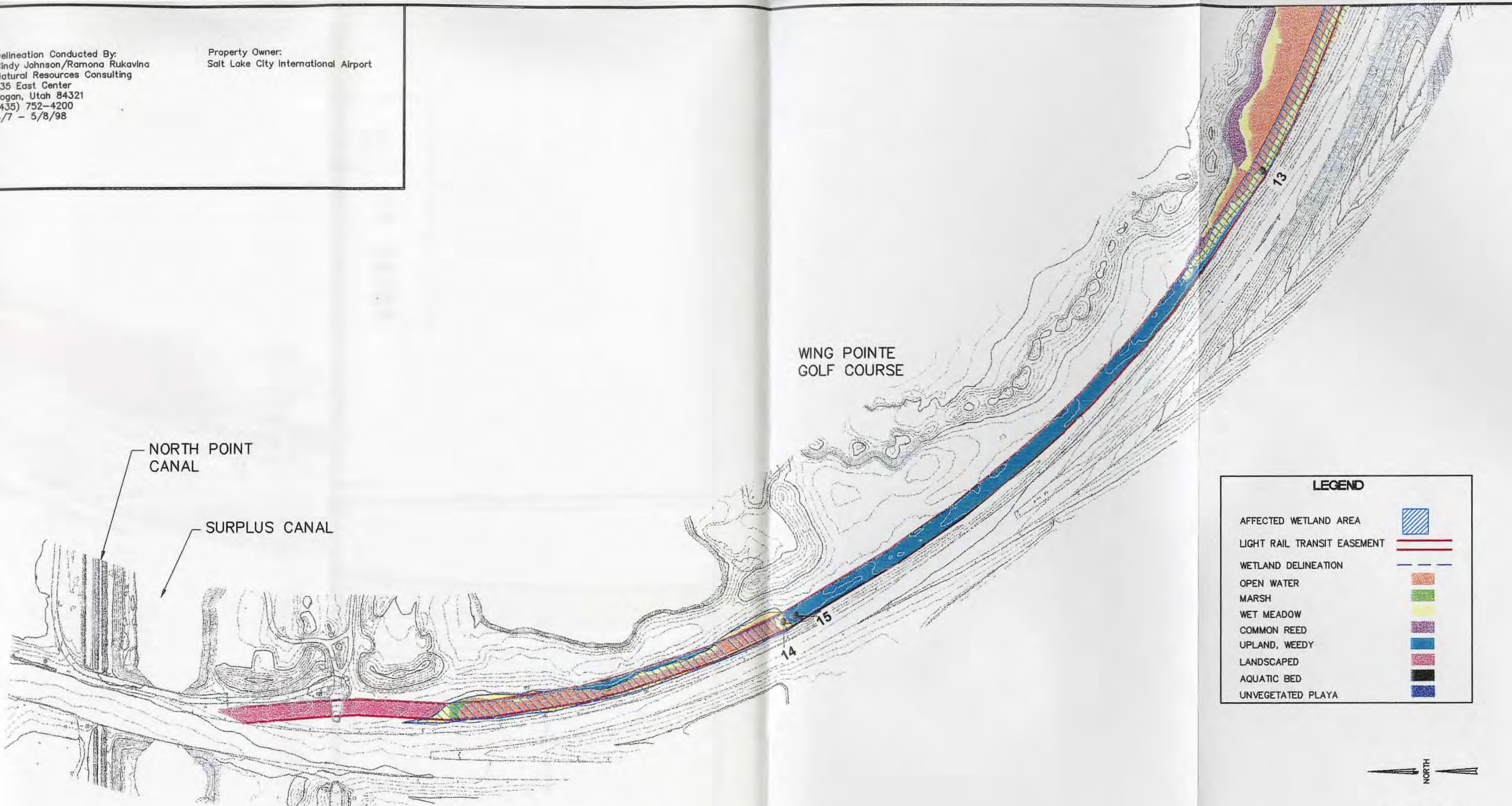
Logan, Utah 84321
(435) 752-4200
5/7 - 5/8/98

Property Owner:
Salt Lake City International Airport




# = Sample Site Locations

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UTA TRAX TRANSIT EXPRESS

# West-East LRT FEIS
## Impacted Wetland Areas - Map2

Figure 2

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Delineation Conducted By:
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Natural Resources Consulting
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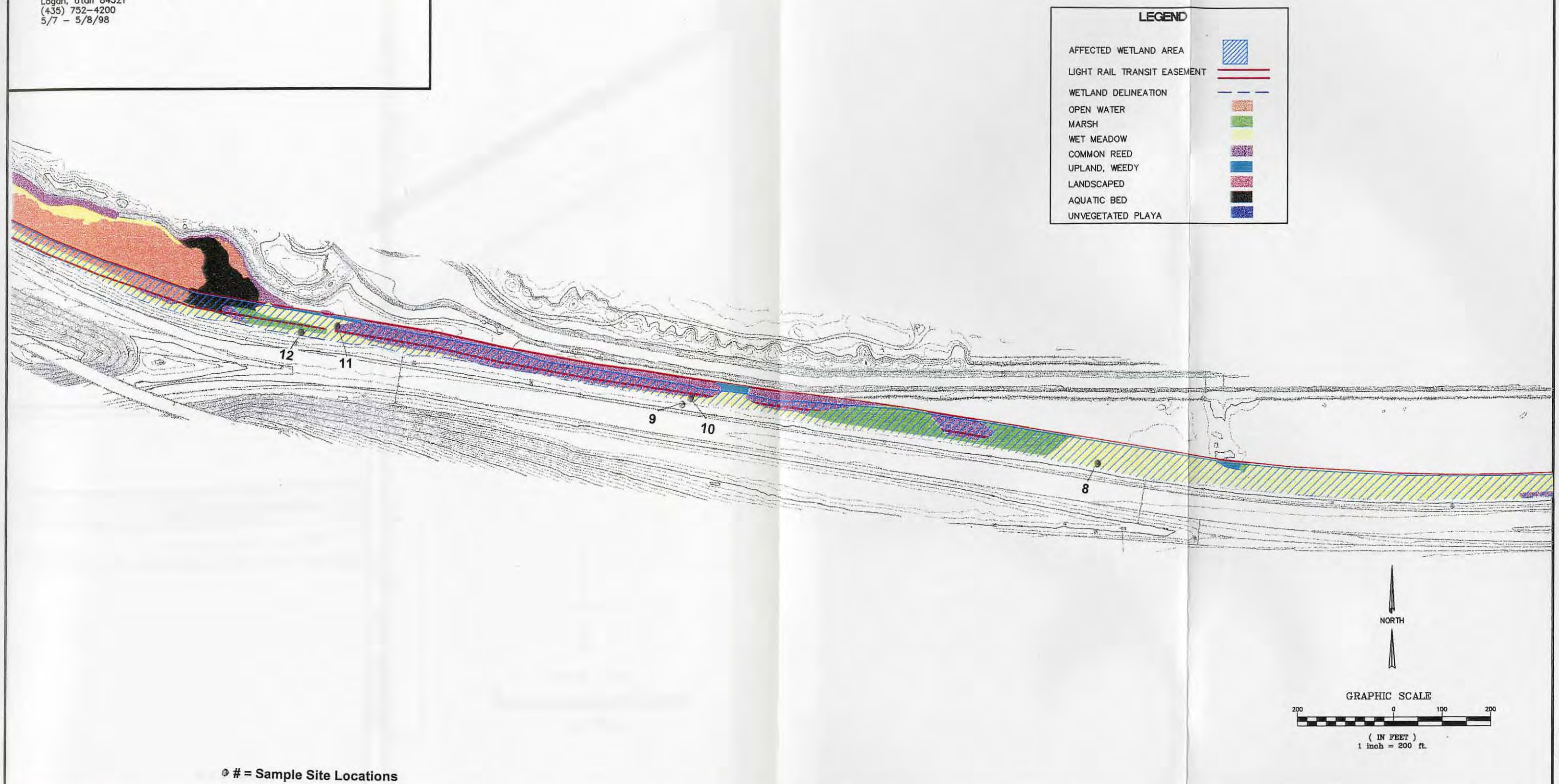
Logan, Utah 84321
(435) 752-4200
5/7 - 5/8/98

Property Owner:
Salt Lake City International Airport

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West-East LRT FEIS
Impacted Wetland Areas - Map 3

Figure 2

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Delineation Conducted By:
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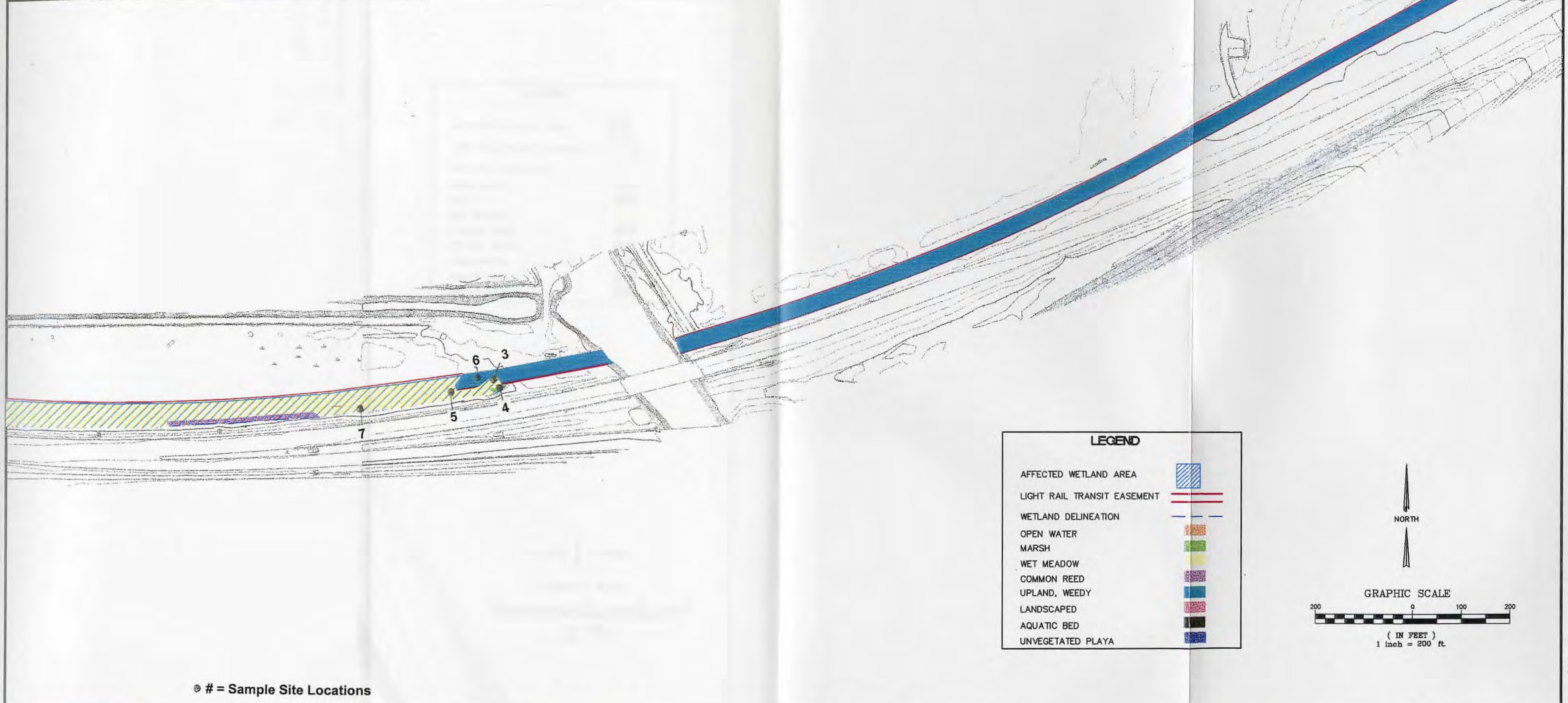
Property Owner:
Salt Lake City International Airport




⊚ # = Sample Site Locations

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West-East LRT FEIS
Impacted Wetland Areas - Map 4

Figure 2

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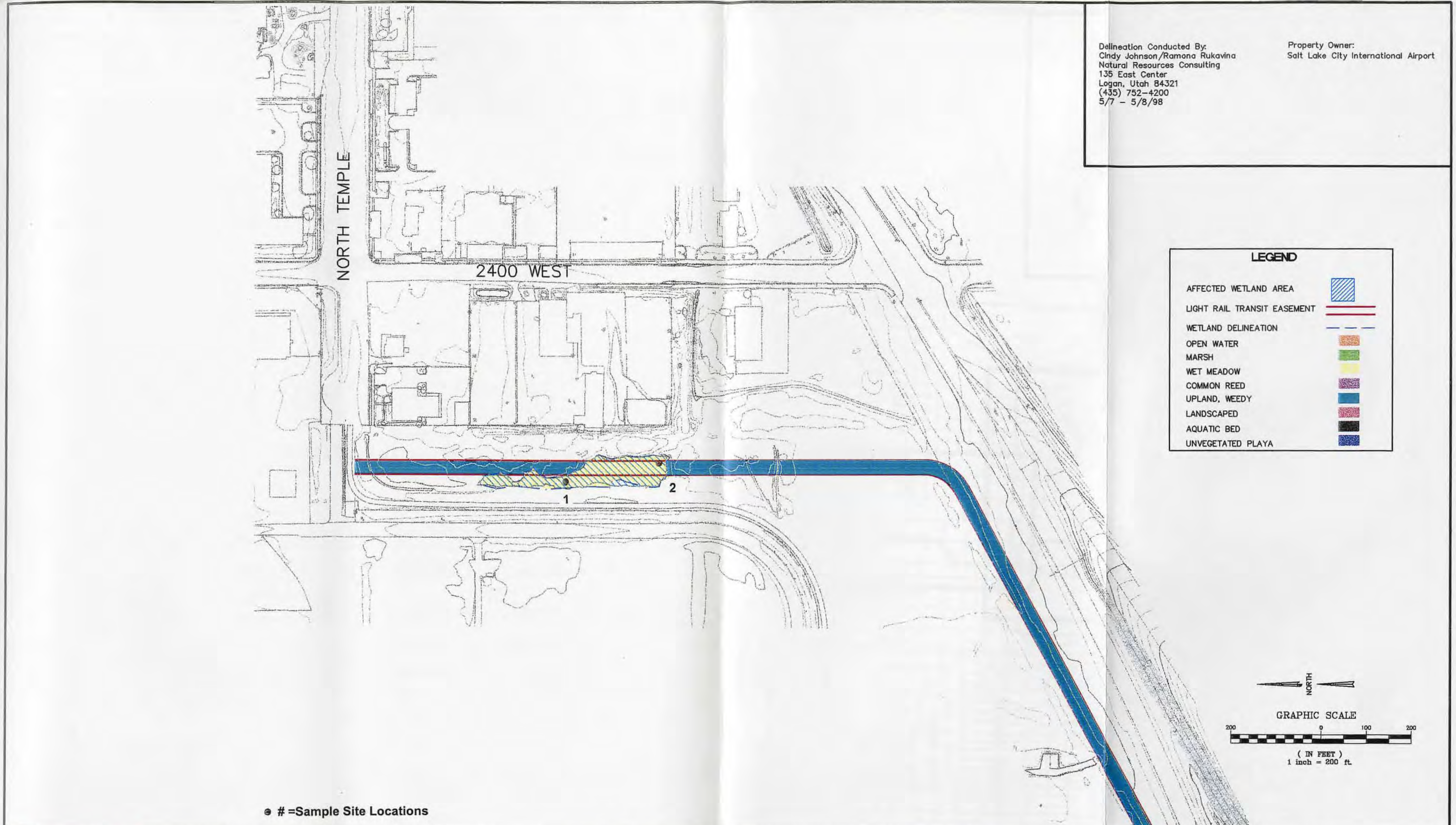


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UTA TRAX TRANSIT EXPRESS

# West-East LRT FEIS
## Impacted Wetland Areas - Map 5

Figure 2

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## DATA FORM
## ROUTINE WETLAND DETERMINATION
**(1987 COE Wetlands Delineation Manual)**

| | | | |
|---|---|---|---|
| **Project/Site:** | West/East Light Rail Transit Alignment | **Date:** | 5/7/98 |
| **Applicant/Owner:** | Wasatch Front Regional Council | **County:** | Salt Lake |
| **Investigator:** | Cindy Johnson/Ramona Rukavina | **State:** | Utah |

| | | | |
|---|---|---|---|
| **Do normal circumstances exist on the site?** | Yes | **Community ID:** | |
| **Is the site significantly disturbed (Atypical Situation)?** | No | **Transect ID:** | |
| **Is the area a potential problem area?** | No | **Plot ID:** | 1 |

### VEGETATION

| | Dominant Plant Species | Stratum | Indicator | | Dominant Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|---|---|
| 1 | unknown grass (25%) | H | ? | 9 | | | |
| 2 | Distichlis spicata (20%) | H | FAC+* | 10 | | | |
| 3 | Rumex crispus (5%) | H | FAC | 11 | | | |
| 4 | | | | 12 | | | |
| 5 | | | | 13 | | | |
| 6 | | | | 14 | | | |
| 7 | | | | 15 | | | |
| 8 | | | | 16 | | | |

**Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-)?** >50%

**Remarks:** dominant grass species unidentified due to phenology, status to be determined later

### HYDROLOGY

**AVAILABLE DATA**

__ Recorded Data

- Stream, Lake, or Tide Gauge __
- Aerial Photographs __
- Other __

X No Recorded Data

**FIELD OBSERVATIONS**

- Depth of Surface Water: __ inches
- Depth to Free Water in Pit: __ inches
- Depth to Saturated Soil: 0 inches

**WETLAND HYDROLOGY INDICATORS**

| Primary Indicators: | Secondary Indicators: |
|---|---|
| __ Inundated | __ Oxidized Root Zones |
| X Saturated in Upper 12" | __ Water-Stained Leaves |
| X Water Marks | __ Local Soil Survey Data |
| __ Drift Lines | __ FAC-Neutral Test |
| __ Sediment Deposits | __ Other |
| X Drainage Patterns | |

**Remarks:** previously inundated, 40% cover by matted litter with indications of past inundation, subject to seasonal inundation; concave topographic position; receives surface runoff from surrounding area

## SOILS

| | | | |
|---|---|---|---|
| **Map Unit Name (Series & Phase):** | Leland fine sandy loam | **Drainage Class:** | somewhat poor |
| **Taxonomy (Subgroup):** | Typic Natrustalfs | **Field Observations Confirm Map Type?** | |

**PROFILE DESCRIPTION**

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle (Abundance/Contrast) | Texture, Structure, Concretions, etc. |
|---|---|---|---|---|---|
| 0-10" | A | 2.5Y 2.5/1 | | | silty clay |
| 10-18" | B | 2.5Y 4/2 | | | clayey sand |

**HYDRIC SOIL INDICATORS**

| | | | |
|---|---|---|---|
| ___ | Histosol | ___ | Concretions |
| ___ | Histic Epipedon | ___ | High Organic Content in Surface Layer in Sandy Soils |
| ___ | Sulfidic Odor | ___ | Organic Streaking in Sandy Soils |
| ___ | Aquic Moisture Regime | ___ | Listed on Local Hydric Soils List |
| ___ | Reducing Conditions | ___ | Other |
| X | Gleyed or Low-Chroma Colors | | |

**Remarks:** strong smell of landfill, surface soils saturated, subsoils very moist

## WETLAND DETERMINATION

| | | | |
|---|---|---|---|
| **Hydrophytic Vegetation Present?** | Yes | **Hydric Soils Present?** | Yes |
| **Wetland Hydrology Present?** | Yes | **Is the Sampling Point Within a Wetland?** | Yes |

**Rationale:** Soil and hydrology criteria met. Identifiable plant species hydrophytic; status of dominant species to be determined later.

# DATA FORM
# ROUTINE WETLAND DETERMINATION
### (1987 COE Wetlands Delineation Manual)

| | | | |
|---|---|---|---|
| **Project/Site:** | West/East Light Rail Transit Alignment | **Date:** | 5/7/98 |
| **Applicant/Owner:** | Wasatch Front Regional Council | **County:** | Salt Lake |
| **Investigator:** | Cindy Johnson/Ramona Rukavina | **State:** | Utah |

| | | | |
|---|---|---|---|
| **Do normal circumstances exist on the site?** | Yes | **Community ID:** | |
| **Is the site significantly disturbed** (Atypical Situation)? | No | **Transect ID:** | |
| **Is the area a potential problem area?** | No | **Plot ID:** | 2 |

## VEGETATION

| | Dominant Plant Species | Stratum | Indicator | | Dominant Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|---|---|
| 1 | Distichlis spicata (50%) | H | FAC+* | 9 | | | |
| 2 | Rumex crispus (1%) | H | FAC | 10 | | | |
| 3 | unknown grass (5%) | H | ? | 11 | | | |
| 4 | | | | 12 | | | |
| 5 | | | | 13 | | | |
| 6 | | | | 14 | | | |
| 7 | | | | 15 | | | |
| 8 | | | | 16 | | | |

**Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-)?** >50%

**Remarks:** unknown grass species unidentifiable due to plant phenology; status to be determined later.

## HYDROLOGY

**AVAILABLE DATA**

- ___ Recorded Data
  - Stream, Lake, or Tide Gauge ___
  - Aerial Photographs ___
  - Other ___
- X No Recorded Data

**FIELD OBSERVATIONS**

- Depth of Surface Water: ___ inches
- Depth to Free Water in Pit: ___ inches
- Depth to Saturated Soil: 0 inches

**WETLAND HYDROLOGY INDICATORS**

| Primary Indicators: | Secondary Indicators: |
|---|---|
| ___ Inundated | ___ Oxidized Root Zones |
| X Saturated in Upper 12" | ___ Water-Stained Leaves |
| X Water Marks | ___ Local Soil Survey Data |
| ___ Drift Lines | ___ FAC-Neutral Test |
| ___ Sediment Deposits | ___ Other |
| X Drainage Patterns | |

**Remarks:** saturated surface soils; 40% cover by matted litter with evidence of past inundation; concave topographic position; subject to seasonal inundation and surface runoff from surrounding area

## SOILS

| | | | |
|---|---|---|---|
| **Map Unit Name (Series & Phase):** | Leland fine sandy loam | **Drainage Class:** | somewhat poor |
| **Taxonomy (Subgroup):** | Typic Natrustalfs | **Field Observations Confirm Map Type?** | |

**PROFILE DESCRIPTION**

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle (Abundance/Contrast) | Texture, Structure, Concretions, etc. |
|---|---|---|---|---|---|
| 0-15" | A | 7.5YR 2.5/1 | | | silty clay |
| 15-18" | B | 2.5Y 3/2 | orange | few, faint | clayey sand |

**HYDRIC SOIL INDICATORS**

| | | | |
|---|---|---|---|
| ___ | Histosol | ___ | Concretions |
| ___ | Histic Epipedon | ___ | High Organic Content in Surface Layer in Sandy Soils |
| ___ | Sulfidic Odor | ___ | Organic Streaking in Sandy Soils |
| ___ | Aquic Moisture Regime | ___ | Listed on Local Hydric Soils List |
| ___ | Reducing Conditions | ___ | Other |
| X | Gleyed or Low-Chroma Colors | | |

**Remarks:** soil smells like landfill; saturated to surface

## WETLAND DETERMINATION

| | | | |
|---|---|---|---|
| **Hydrophytic Vegetation Present?** | Yes | **Hydric Soils Present?** | Yes |
| **Wetland Hydrology Present?** | Yes | **Is the Sampling Point Within a Wetland?** | Yes |

**Rationale:** All criteria met.

# DATA FORM
# ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

| | | | |
|---|---|---|---|
| **Project/Site:** | West/East Light Rail Transit Alignment | **Date:** | 5/8/98 |
| **Applicant/Owner:** | Wasatch Front Regional Council | **County:** | Salt Lake |
| **Investigator:** | Cindy Johnson, Ramona Rukavina | **State:** | Utah |
| **Do normal circumstances exist on the site?** | Yes | **Community ID:** | |
| **Is the site significantly disturbed** (Atypical Situation)? | No | **Transect ID:** | |
| **Is the area a potential problem area?** | No | **Plot ID:** | 3 |

VEGETATION

| | Dominant Plant Species | Stratum | Indicator | | Dominant Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|---|---|
| 1 | Distichlis spicata (50%) | H | FAC+* | 9 | | | |
| 2 | unknown grass (20%) | H | ? | 10 | | | |
| 3 | Typha latifolia (5%) | H | OBL | 11 | | | |
| 4 | Cardaria draba (5%) | H | NL | 12 | | | |
| 5 | | | | 13 | | | |
| 6 | | | | 14 | | | |
| 7 | | | | 15 | | | |
| 8 | | | | 16 | | | |

**Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-)?** inconclusive

**Remarks:** interface between Distichlis dominated meadow and weedy upland meadow

HYDROLOGY

**AVAILABLE DATA**

___ Recorded Data

- Stream, Lake, or Tide Gauge ___
- Aerial Photographs ___
- Other ___

X No Recorded Data

**FIELD OBSERVATIONS**

- Depth of Surface Water: ___ inches
- Depth to Free Water in Pit: ___ inches
- Depth to Saturated Soil: ___ inches

**WETLAND HYDROLOGY INDICATORS**

| Primary Indicators: | | Secondary Indicators: | |
|---|---|---|---|
| ___ | Inundated | X | Oxidized Root Zones |
| ___ | Saturated in Upper 12" | ___ | Water-Stained Leaves |
| ___ | Water Marks | ___ | Local Soil Survey Data |
| ___ | Drift Lines | ___ | FAC-Neutral Test |
| ___ | Sediment Deposits | ___ | Other |
| X | Drainage Patterns | | |

**Remarks:** margin of concave topographic position; wet meadow on perimeter of marsh area

## SOILS

| | | | |
|---|---|---|---|
| **Map Unit Name (Series & Phase):** | Saltair silty clay loam | **Drainage Class:** | poor |
| **Taxonomy (Subgroup):** | Typic Salorthids | **Field Observations Confirm Map Type?** | |

**PROFILE DESCRIPTION**

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle (Abundance/Contrast) | Texture, Structure, Concretions, etc. |
|---|---|---|---|---|---|
| 0-2" | A | 2.5Y 5/2 | orange | faint | loamy clay |
| 2-18" | B | 2.5Y 4/3 | orange, gley1 6/10Y | bright, extensive | loamy clay |

**HYDRIC SOIL INDICATORS**

| | | | |
|---|---|---|---|
| ___ | Histosol | ___ | Concretions |
| ___ | Histic Epipedon | ___ | High Organic Content in Surface Layer in Sandy Soils |
| ___ | Sulfidic Odor | ___ | Organic Streaking in Sandy Soils |
| ___ | Aquic Moisture Regime | X | Listed on Local Hydric Soils List |
| ___ | Reducing Conditions | X | Other |
| ___ | Gleyed or Low-Chroma Colors | | |

**Remarks:** soils moist; streaks of organic material; mottles and gleyed inclusions

## WETLAND DETERMINATION

| | | | |
|---|---|---|---|
| **Hydrophytic Vegetation Present?** | Inconclusive | **Hydric Soils Present?** | Yes |
| **Wetland Hydrology Present?** | Yes | **Is the Sampling Point Within a Wetland?** | Yes? |

**Rationale:** Soil and hydrology criteria met. Subdominant plant species unidentifiable due to phenology, but dominant species hydrophytic. Vegetation status to be clarified later.

# DATA FORM
# ROUTINE WETLAND DETERMINATION
### (1987 COE Wetlands Delineation Manual)

| | | | |
|---|---|---|---|
| **Project/Site:** | West/East Light Rail Transit Alignment | **Date:** | 5/8/98 |
| **Applicant/Owner:** | Wasatch Front Regional Council | **County:** | Salt Lake |
| **Investigator:** | Cindy Johnson/Ramona Rukavina | **State:** | Utah |

| | | | |
|---|---|---|---|
| **Do normal circumstances exist on the site?** | Yes | **Community ID:** | |
| **Is the site significantly disturbed** (Atypical Situation)? | No | **Transect ID:** | |
| **Is the area a potential problem area?** | No | **Plot ID:** | 4 |

## VEGETATION

| | Dominant Plant Species | Stratum | Indicator | | Dominant Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|---|---|
| 1 | Typha latifolia (100%) | H | OBL | 9 | | | |
| 2 | | | | 10 | | | |
| 3 | | | | 11 | | | |
| 4 | | | | 12 | | | |
| 5 | | | | 13 | | | |
| 6 | | | | 14 | | | |
| 7 | | | | 15 | | | |
| 8 | | | | 16 | | | |

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-)? 100%

**Remarks:** small marsh area surrounded by saltgrass meadow

## HYDROLOGY

**AVAILABLE DATA**

___ Recorded Data

- Stream, Lake, or Tide Gauge ___
- Aerial Photographs ___
- Other ___

X No Recorded Data

**FIELD OBSERVATIONS**

- Depth of Surface Water: 3 inches
- Depth to Free Water in Pit: ___ inches
- Depth to Saturated Soil: ___ inches

**WETLAND HYDROLOGY INDICATORS**

| Primary Indicators: | Secondary Indicators: |
|---|---|
| X Inundated | ___ Oxidized Root Zones |
| ___ Saturated in Upper 12" | ___ Water-Stained Leaves |
| ___ Water Marks | ___ Local Soil Survey Data |
| ___ Drift Lines | ___ FAC-Neutral Test |
| ___ Sediment Deposits | ___ Other |
| X Drainage Patterns | |

**Remarks:** at least seasonally inundated, concave topographic position

## SOILS

| | | | |
|---|---|---|---|
| **Map Unit Name (Series & Phase):** | Saltair silty clay loam | **Drainage Class:** | poor |
| **Taxonomy (Subgroup):** | Typic Salorthids | **Field Observations Confirm Map Type?** | |

**PROFILE DESCRIPTION**

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle (Abundance/Contrast) | Texture, Structure, Concretions, etc. |
|---|---|---|---|---|---|

**HYDRIC SOIL INDICATORS**

| | | | |
|---|---|---|---|
| ___ | Histosol | ___ | Concretions |
| ___ | Histic Epipedon | ___ | High Organic Content in Surface Layer in Sandy Soils |
| ___ | Sulfidic Odor | ___ | Organic Streaking in Sandy Soils |
| ___ | Aquic Moisture Regime | X | Listed on Local Hydric Soils List |
| ___ | Reducing Conditions | ___ | Other |
| ___ | Gleyed or Low-Chroma Colors | | |

**Remarks:** assume hydric based on 100% obligate hydrophytes

## WETLAND DETERMINATION

| | | | |
|---|---|---|---|
| **Hydrophytic Vegetation Present?** | Yes | **Hydric Soils Present?** | Yes |
| **Wetland Hydrology Present?** | Yes | **Is the Sampling Point Within a Wetland?** | Yes |

**Rationale:** All criteria met.

# DATA FORM
# ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

| | | | |
|---|---|---|---|
| Project/Site: | West/East Light Rail Transit Alignment | Date: | 5/8/98 |
| Applicant/Owner: | Wasatch Front Regional Council | County: | Salt Lake |
| Investigator: | Cindy Johnson/Ramona Rukavina | State: | Utah |

| | | | |
|---|---|---|---|
| Do normal circumstances exist on the site? | Yes | Community ID: | |
| Is the site significantly disturbed (Atypical Situation)? | No | Transect ID: | |
| Is the area a potential problem area? | No | Plot ID: | 5 |

## VEGETATION

| | Dominant Plant Species | Stratum | Indicator | | Dominant Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|---|---|
| 1 | Distichlis spicata (80%) | H | FAC+* | 9 | | | |
| 2 | Cardaria draba (5%) | H | NL | 10 | | | |
| 3 | Rumex crispus (5%) | H | FAC | 11 | | | |
| 4 | | | | 12 | | | |
| 5 | | | | 13 | | | |
| 6 | | | | 14 | | | |
| 7 | | | | 15 | | | |
| 8 | | | | 16 | | | |

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-)? >50%

Remarks: wet meadow vegetation dominated by saltgrass

## HYDROLOGY

**AVAILABLE DATA**

___ Recorded Data

- Stream, Lake, or Tide Gauge ___
- Aerial Photographs ___
- Other ___

X No Recorded Data

**FIELD OBSERVATIONS**

- Depth of Surface Water: ___ Inches
- Depth to Free Water in Pit: ___ Inches
- Depth to Saturated Soil: ___ Inches

**WETLAND HYDROLOGY INDICATORS**

| Primary Indicators: | Secondary Indicators: |
|---|---|
| ___ Inundated | X Oxidized Root Zones |
| ___ Saturated in Upper 12" | ___ Water-Stained Leaves |
| ___ Water Marks | ___ Local Soil Survey Data |
| ___ Drift Lines | ___ FAC-Neutral Test |
| ___ Sediment Deposits | ___ Other |
| X Drainage Patterns | |

Remarks: concave topographic position in highway right-of-way

## SOILS

| | | | |
|---|---|---|---|
| **Map Unit Name (Series & Phase):** | Saltair silty clay loam | **Drainage Class:** | poor |
| **Taxonomy (Subgroup):** | Typic Salorthids | **Field Observations Confirm Map Type?** | |

**PROFILE DESCRIPTION**

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle (Abundance/Contrast) | Texture, Structure, Concretions, etc. |
|---|---|---|---|---|---|
| 0-16" | A | 2.5Y 5/3 | orange, gley1 6/10Y | faint to bright, extensive | loamy clay |
| 16-18" | B | 10YR 3/2 | | | silty clay loam |

**HYDRIC SOIL INDICATORS**

| | | | |
|---|---|---|---|
| ___ | Histosol | ___ | Concretions |
| ___ | Histic Epipedon | ___ | High Organic Content in Surface Layer in Sandy Soils |
| ___ | Sulfidic Odor | ___ | Organic Streaking in Sandy Soils |
| ___ | Aquic Moisture Regime | X | Listed on Local Hydric Soils List |
| ___ | Reducing Conditions | ___ | Other |
| ___ | Gleyed or Low-Chroma Colors | | |

Remarks: extensive orange and gleyed mottles, organic matter streaking

## WETLAND DETERMINATION

| | | | |
|---|---|---|---|
| **Hydrophytic Vegetation Present?** | Yes | **Hydric Soils Present?** | Yes |
| **Wetland Hydrology Present?** | Yes | **Is the Sampling Point Within a Wetland?** | Yes |

Rationale: All criteria met.

# DATA FORM
# ROUTINE WETLAND DETERMINATION
### (1987 COE Wetlands Delineation Manual)

| | | | |
|---|---|---|---|
| **Project/Site:** | West/East Light Rail Transit Alignment | **Date:** | 5/8/98 |
| **Applicant/Owner:** | Wasatch Front Regional Council | **County:** | Salt Lake |
| **Investigator:** | Cindy Johnson, Ramona Rukavina | **State:** | Utah |

| | | | |
|---|---|---|---|
| **Do normal circumstances exist on the site?** | Yes | **Community ID:** | |
| **Is the site significantly disturbed (Atypical Situation)?** | Yes | **Transect ID:** | |
| **Is the area a potential problem area?** | No | **Plot ID:** | 6 |

## VEGETATION

| | Dominant Plant Species | Stratum | Indicator | | Dominant Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|---|---|
| 1 | Cardaria draba (90%) | H | NL | 9 | | | |
| 2 | Bromus tectorum (10%) | H | NL | 10 | | | |
| 3 | | | | 11 | | | |
| 4 | | | | 12 | | | |
| 5 | | | | 13 | | | |
| 6 | | | | 14 | | | |
| 7 | | | | 15 | | | |
| 8 | | | | 16 | | | |

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-)? 0%

Remarks: weedy upland vegetation on fill area

## HYDROLOGY

**AVAILABLE DATA**

___ Recorded Data

- Stream, Lake, or Tide Gauge ___
- Aerial Photographs ___
- Other ___

X No Recorded Data

**FIELD OBSERVATIONS**

- Depth of Surface Water: ___ Inches
- Depth to Free Water in Pit: ___ inches
- Depth to Saturated Soil: ___ inches

**WETLAND HYDROLOGY INDICATORS**

| Primary Indicators: | Secondary Indicators: |
|---|---|
| ___ Inundated | ___ Oxidized Root Zones |
| ___ Saturated in Upper 12" | ___ Water-Stained Leaves |
| ___ Water Marks | ___ Local Soil Survey Data |
| ___ Drift Lines | ___ FAC-Neutral Test |
| ___ Sediment Deposits | ___ Other |
| ___ Drainage Patterns | |

Remarks: soil dry to 18", moist below; no oxidized iron, convex topographic position

## SOILS

| | | | |
|---|---|---|---|
| **Map Unit Name (Series & Phase):** | Saltair silty clay loam | **Drainage Class:** | poor |
| **Taxonomy (Subgroup):** | Typic Salorthids | **Field Observations Confirm Map Type?** | No |

**PROFILE DESCRIPTION**

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle (Abundance/Contrast) | Texture, Structure, Concretions, etc. |
|---|---|---|---|---|---|
| 0-18" | fill | 2.5Y 6/3 | | | mixed fill |

**HYDRIC SOIL INDICATORS**

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Other

**Remarks:** apparently fill material deposited over native soils, no oxidized iron

## WETLAND DETERMINATION

| | | | |
|---|---|---|---|
| **Hydrophytic Vegetation Present?** | No | **Hydric Soils Present?** | No |
| **Wetland Hydrology Present?** | No | **Is the Sampling Point Within a Wetland?** | No |

**Rationale:** No criteria met. Located on fill material.

# DATA FORM
# ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

| | | | |
|---|---|---|---|
| **Project/Site:** | West/East Light Rail Transit Alignment | **Date:** | 5/8/98 |
| **Applicant/Owner:** | Wasatch Front Regional Council | **County:** | Salt Lake |
| **Investigator:** | Cindy Johnson/Ramona Rukavina | **State:** | Utah |

| | | | |
|---|---|---|---|
| **Do normal circumstances exist on the site?** | Yes | **Community ID:** | |
| **Is the site significantly disturbed** (Atypical Situation)? | No | **Transect ID:** | |
| **Is the area a potential problem area?** | No | **Plot ID:** | 7 |

## VEGETATION

| | Dominant Plant Species | Stratum | Indicator | | Dominant Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|---|---|
| 1 | Distichlis spicata (90%) | H | FAC+* | 9 | | | |
| 2 | unknown Poa spp. (5%) | H | ? | 10 | | | |
| 3 | | | | 11 | | | |
| 4 | | | | 12 | | | |
| 5 | | | | 13 | | | |
| 6 | | | | 14 | | | |
| 7 | | | | 15 | | | |
| 8 | | | | 16 | | | |

**Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-)?** >50%

**Remarks:** transition between vegetation on road fill and meadow vegetation in unfilled highway right-of-way

## HYDROLOGY

**AVAILABLE DATA**

- ___ Recorded Data
  - Stream, Lake, or Tide Gauge ___
  - Aerial Photographs ___
  - Other ___
- X No Recorded Data

**FIELD OBSERVATIONS**

- Depth of Surface Water: ___ inches
- Depth to Free Water in Pit: ___ inches
- Depth to Saturated Soil: ___ inches

**WETLAND HYDROLOGY INDICATORS**

| Primary Indicators: | Secondary Indicators: |
|---|---|
| ___ Inundated | X Oxidized Root Zones |
| ___ Saturated in Upper 12" | ___ Water-Stained Leaves |
| ___ Water Marks | ___ Local Soil Survey Data |
| ___ Drift Lines | ___ FAC-Neutral Test |
| ___ Sediment Deposits | ___ Other |
| X Drainage Patterns | |

**Remarks:** edge of concave topographic position; soils moist

## SOILS

| | | | |
|---|---|---|---|
| **Map Unit Name (Series & Phase):** | Saltair silty clay loam | **Drainage Class:** | poor |
| **Taxonomy (Subgroup):** | Typic Salorthids | **Field Observations Confirm Map Type?** | |

**PROFILE DESCRIPTION**

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle (Abundance/Contrast) | Texture, Structure, Concretions, etc. |
|---|---|---|---|---|---|
| 0-8" | fill | 10YR 5/3 | | | sandy clay with rocks and cobbles |
| 8-16" | A | 2.5Y 3/2 | orange | moderate | loamy clay |

**HYDRIC SOIL INDICATORS**

| | | | |
|---|---|---|---|
| ___ | Histosol | ___ | Concretions |
| ___ | Histic Epipedon | ___ | High Organic Content in Surface Layer in Sandy Soils |
| ___ | Sulfidic Odor | ___ | Organic Streaking in Sandy Soils |
| ___ | Aquic Moisture Regime | X | Listed on Local Hydric Soils List |
| ___ | Reducing Conditions | ___ | Other |
| ___ | Gleyed or Low-Chroma Colors | | |

**Remarks:** mottles and oxidized rhizospheres in native soil below fill material migrating from road fill; organic matter streaking and gleyed inclusions below 16"; soils moist

## WETLAND DETERMINATION

| | | | |
|---|---|---|---|
| **Hydrophytic Vegetation Present?** | Yes | **Hydric Soils Present?** | Yes |
| **Wetland Hydrology Present?** | Yes | **Is the Sampling Point Within a Wetland?** | Yes |

**Rationale:** All criteria met in native soils below migrating fill material.

# DATA FORM
# ROUTINE WETLAND DETERMINATION
**(1987 COE Wetlands Delineation Manual)**

| | | | |
|---|---|---|---|
| **Project/Site:** | West/East Light Rail Transit Alignment | **Date:** | 5/8/98 |
| **Applicant/Owner:** | Wasatch Front Regional Council | **County:** | Salt Lake |
| **Investigator:** | Cindy Johnson/Ramona Rukavina | **State:** | Utah |

| | | | |
|---|---|---|---|
| **Do normal circumstances exist on the site?** | Yes | **Community ID:** | |
| **Is the site significantly disturbed (Atypical Situation)?** | No | **Transect ID:** | |
| **Is the area a potential problem area?** | No | **Plot ID:** | 8 |

## VEGETATION

| | Dominant Plant Species | Stratum | Indicator | | Dominant Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|---|---|
| 1 | Distichlis spicata (98%) | H | FAC+* | 9 | | | |
| 2 | Typha latifolia (2%) | H | OBL | 10 | | | |
| 3 | | | | 11 | | | |
| 4 | | | | 12 | | | |
| 5 | | | | 13 | | | |
| 6 | | | | 14 | | | |
| 7 | | | | 15 | | | |
| 8 | | | | 16 | | | |

**Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-)?** 100%

**Remarks:** just upstream of marsh area; edge of road fill

## HYDROLOGY

| AVAILABLE DATA | WETLAND HYDROLOGY INDICATORS | |
|---|---|---|
| ___ Recorded Data | **Primary Indicators:** | **Secondary Indicators:** |
| Stream, Lake, or Tide Gauge ___ | ___ Inundated | ___ Oxidized Root Zones |
| Aerial Photographs ___ | ___ Saturated in Upper 12" | ___ Water-Stained Leaves |
| Other ___ | ___ Water Marks | ___ Local Soil Survey Data |
| X No Recorded Data | ___ Drift Lines | ___ FAC-Neutral Test |
| **FIELD OBSERVATIONS** | ___ Sediment Deposits | ___ Other |
| Depth of Surface Water: ___ inches | X Drainage Patterns | |
| Depth to Free Water in Pit: ___ inches | | |
| Depth to Saturated Soil: ___ inches | | |

**Remarks:** edge of concave topographic position;

## SOILS

| | | | |
|---|---|---|---|
| **Map Unit Name (Series & Phase):** | Leland fine sandy loam | **Drainage Class:** | somewhat poor |
| **Taxonomy (Subgroup):** | Typic Natrustalfs | **Field Observations Confirm Map Type?** | |

**PROFILE DESCRIPTION**

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle (Abundance/Contrast) | Texture, Structure, Concretions, etc. |
|---|---|---|---|---|---|
| 0-4" | fill | 2.5Y 5/2 | | | clayey sand |
| 4-18" | A | 2.5Y 4/1 | orange | faint, diffuse | fine sandy clay |

**HYDRIC SOIL INDICATORS**

| | | | |
|---|---|---|---|
| ___ | Histosol | ___ | Concretions |
| ___ | Histic Epipedon | ___ | High Organic Content in Surface Layer in Sandy Soils |
| ___ | Sulfidic Odor | ___ | Organic Streaking in Sandy Soils |
| ___ | Aquic Moisture Regime | X | Listed on Local Hydric Soils List |
| ___ | Reducing Conditions | ___ | Other |
| X | Gleyed or Low-Chroma Colors | | |

**Remarks:** extensive organic matter streaking, soils moist, fill material migrating from road fill onto native soils

## WETLAND DETERMINATION

| | | | |
|---|---|---|---|
| **Hydrophytic Vegetation Present?** | Yes | **Hydric Soils Present?** | Yes |
| **Wetland Hydrology Present?** | Marginal | **Is the Sampling Point Within a Wetland?** | Yes |

**Rationale:** Vegetation criterion met. Soil criterion met by native soils under migrating road fill material. Hydrology criterion met by topography.

# DATA FORM
# ROUTINE WETLAND DETERMINATION
### (1987 COE Wetlands Delineation Manual)

| | | | |
|---|---|---|---|
| **Project/Site:** | West/East Light Rail Transit Alignment | **Date:** | 5/8/98 |
| **Applicant/Owner:** | Wasatch Front Regional Council | **County:** | Salt Lake |
| **Investigator:** | Cindy Johnson/ Ramona Rukavina | **State:** | Utah |

| | | | |
|---|---|---|---|
| **Do normal circumstances exist on the site?** | Yes | **Community ID:** | |
| **Is the site significantly disturbed (Atypical Situation)?** | Yes | **Transect ID:** | |
| **Is the area a potential problem area?** | No | **Plot ID:** | 9 |

## VEGETATION

| | Dominant Plant Species | Stratum | Indicator | | Dominant Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|---|---|
| 1 | Hordeum jubatum (65%) | H | FAC+ | 9 | | | |
| 2 | Sporobolus airoides (30%) | H | FAC- | 10 | | | |
| 3 | Rumex crispus (5%) | H | FAC | 11 | | | |
| 4 | | | | 12 | | | |
| 5 | | | | 13 | | | |
| 6 | | | | 14 | | | |
| 7 | | | | 15 | | | |
| 8 | | | | 16 | | | |

**Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-)?** 50%

**Remarks:** transition zone between Sporobolus airoides dominated area and Hordeum jubatum dominated area

## HYDROLOGY

**AVAILABLE DATA**

___ Recorded Data

- Stream, Lake, or Tide Gauge ___
- Aerial Photographs ___
- Other ___

X No Recorded Data

**FIELD OBSERVATIONS**

- Depth of Surface Water: ___ inches
- Depth to Free Water in Pit: ___ inches
- Depth to Saturated Soil: ___ inches

**WETLAND HYDROLOGY INDICATORS**

| Primary Indicators: | | Secondary Indicators: | |
|---|---|---|---|
| ___ | Inundated | X | Oxidized Root Zones |
| ___ | Saturated in Upper 12" | ___ | Water-Stained Leaves |
| ___ | Water Marks | ___ | Local Soil Survey Data |
| ___ | Drift Lines | ___ | FAC-Neutral Test |
| ___ | Sediment Deposits | ___ | Other |
| X | Drainage Patterns | | |

**Remarks:** edge of concave topographic position; soils moist

## SOILS

| | | | |
|---|---|---|---|
| **Map Unit Name (Series & Phase):** | Leland fine sandy loam | **Drainage Class:** | somewhat poor |
| **Taxonomy (Subgroup):** | Typic Natrustalfs | **Field Observations Confirm Map Type?** | No |

**PROFILE DESCRIPTION**

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle (Abundance/Contrast) | Texture, Structure, Concretions, etc. |
|---|---|---|---|---|---|
| 0-8" | A | 10YR 3/2 | | | sandy loam |
| 8-18" | B | 10YR 4/3 | | | gravelly coarse sandy loam |

**HYDRIC SOIL INDICATORS**

| | | | |
|---|---|---|---|
| ___ | Histosol | ___ | Concretions |
| ___ | Histic Epipedon | ___ | High Organic Content in Surface Layer in Sandy Soils |
| ___ | Sulfidic Odor | ___ | Organic Streaking in Sandy Soils |
| ___ | Aquic Moisture Regime | ___ | Listed on Local Hydric Soils List |
| ___ | Reducing Conditions | ___ | Other |
| ___ | Gleyed or Low-Chroma Colors | | |

**Remarks:** soils moist, gravel layer in subsoil, apparent fill material, has not developed hydric soil indicators

## WETLAND DETERMINATION

| | | | |
|---|---|---|---|
| **Hydrophytic Vegetation Present?** | Inconclusive | **Hydric Soils Present?** | No |
| **Wetland Hydrology Present?** | Yes | **Is the Sampling Point Within a Wetland?** | No |

**Rationale:** Hydrology criterion met, but vegetation inconclusive and hydric soil indicators absent. Transitional to wetland at slightly lower positions.

# DATA FORM
# ROUTINE WETLAND DETERMINATION
### (1987 COE Wetlands Delineation Manual)

| | | | |
|---|---|---|---|
| **Project/Site:** | West/East Light Rail Transit Alignment | **Date:** | 5/8/98 |
| **Applicant/Owner:** | Wasatch Front Regional Council | **County:** | Salt Lake |
| **Investigator:** | Cindy Johnson/ Ramona Rukavina | **State:** | Utah |

| | | | |
|---|---|---|---|
| **Do normal circumstances exist on the site?** | Yes | **Community ID:** | |
| **Is the site significantly disturbed** (Atypical Situation)? | Yes | **Transect ID:** | |
| **Is the area a potential problem area?** | No | **Plot ID:** | 10 |

## VEGETATION

| | Dominant Plant Species | Stratum | Indicator | | Dominant Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|---|---|
| 1 | Rumex crispus (40%) | H | FAC | 9 | | | |
| 2 | Distichlis spicata (20%) | H | FAC+* | 10 | | | |
| 3 | unknown grass (20%) | H | ? | 11 | | | |
| 4 | Hordeum jubatum (15%) | H | FAC+ | 12 | | | |
| 5 | Carex spp. (5%) | H | UPL to OBL | 13 | | | |
| 6 | | | | 14 | | | |
| 7 | | | | 15 | | | |
| 8 | | | | 16 | | | |

**Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-)?** >50%

**Remarks:** lower position than plot #9; on edge of saltgrass meadow with matted litter indicating past inundation

## HYDROLOGY

**AVAILABLE DATA**

___ Recorded Data

- Stream, Lake, or Tide Gauge ___
- Aerial Photographs ___
- Other ___

X No Recorded Data

**FIELD OBSERVATIONS**

- Depth of Surface Water: ___ inches
- Depth to Free Water in Pit: ___ inches
- Depth to Saturated Soil: ___ inches

**WETLAND HYDROLOGY INDICATORS**

| Primary Indicators: | | Secondary Indicators: | |
|---|---|---|---|
| ___ | Inundated | X | Oxidized Root Zones |
| ___ | Saturated in Upper 12" | ___ | Water-Stained Leaves |
| X | Water Marks | ___ | Local Soil Survey Data |
| ___ | Drift Lines | ___ | FAC-Neutral Test |
| ___ | Sediment Deposits | ___ | Other |
| X | Drainage Patterns | | |

**Remarks:** adjacent areas covered with matted litter indicating past inundation

## SOILS

| | | | |
|---|---|---|---|
| **Map Unit Name (Series & Phase):** | Leland fine sandy loam | **Drainage Class:** | somewhat poor |
| **Taxonomy (Subgroup):** | Typic Natrustalfs | **Field Observations Confirm Map Type?** | No |

**PROFILE DESCRIPTION**

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle (Abundance/Contrast) | Texture, Structure, Concretions, etc. |
|---|---|---|---|---|---|
| 0-8" | A | 10YR 3/2 | | | sandy loam |
| 8-18" | B | 10YR 4/3 | | | gravelly, cobbly coarse sandy loam |

**HYDRIC SOIL INDICATORS**

| | | | |
|---|---|---|---|
| ___ | Histosol | ___ | Concretions |
| ___ | Histic Epipedon | ___ | High Organic Content in Surface Layer in Sandy Soils |
| ___ | Sulfidic Odor | ___ | Organic Streaking in Sandy Soils |
| ___ | Aquic Moisture Regime | ___ | Listed on Local Hydric Soils List |
| ___ | Reducing Conditions | ___ | Other |
| ___ | Gleyed or Low-Chroma Colors | | |

**Remarks:** apparently fill material, has not developed hydric soil indicators

## WETLAND DETERMINATION

| | | | |
|---|---|---|---|
| **Hydrophytic Vegetation Present?** | Yes | **Hydric Soils Present?** | No |
| **Wetland Hydrology Present?** | Yes | **Is the Sampling Point Within a Wetland?** | Yes |

**Rationale:** Vegetation and hydrology criteria met. Soil criterion not met, but apparently fill material which has not developed hydric soil indicators.

# DATA FORM
# ROUTINE WETLAND DETERMINATION
**(1987 COE Wetlands Delineation Manual)**

| | | | |
|---|---|---|---|
| **Project/Site:** | West/East Light Rail Transit Alignment | **Date:** | 5/8/98 |
| **Applicant/Owner:** | Wasatch Front Regional Council | **County:** | Salt Lake |
| **Investigator:** | Cindy Johnson/Ramona Rukavina | **State:** | Utah |

| | | | |
|---|---|---|---|
| **Do normal circumstances exist on the site?** | Yes | **Community ID:** | |
| **Is the site significantly disturbed (Atypical Situation)?** | Yes | **Transect ID:** | |
| **Is the area a potential problem area?** | No | **Plot ID:** | 11 |

VEGETATION

| | Dominant Plant Species | Stratum | Indicator | | Dominant Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|---|---|
| 1 | Phragmites australis (45%) | H | FACW+ | 9 | | | |
| 2 | Scirpus americanus (25%) | H | OBL | 10 | | | |
| 3 | Sporobolus airoides (5%) | H | FAC- | 11 | | | |
| 4 | unknown grass (5%) | H | ? | 12 | | | |
| 5 | | | | 13 | | | |
| 6 | | | | 14 | | | |
| 7 | | | | 15 | | | |
| 8 | | | | 16 | | | |

**Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-)?** >50%

**Remarks:** edges of Phragmites stand adjacent to marsh area

HYDROLOGY

**AVAILABLE DATA**

___ Recorded Data
- Stream, Lake, or Tide Gauge ___
- Aerial Photographs ___
- Other ___

X No Recorded Data

**FIELD OBSERVATIONS**

- Depth of Surface Water: ___ inches
- Depth to Free Water in Pit: ___ inches
- Depth to Saturated Soil: 0 inches

**WETLAND HYDROLOGY INDICATORS**

| Primary Indicators: | | Secondary Indicators: | |
|---|---|---|---|
| ___ | Inundated | X | Oxidized Root Zones |
| X | Saturated in Upper 12" | ___ | Water-Stained Leaves |
| ___ | Water Marks | ___ | Local Soil Survey Data |
| ___ | Drift Lines | ___ | FAC-Neutral Test |
| ___ | Sediment Deposits | ___ | Other |
| ___ | Drainage Patterns | | |

**Remarks:** saturated to surface, orange and black rhizospheres

## SOILS

| | | | |
|---|---|---|---|
| **Map Unit Name (Series & Phase):** | Saltair silty clay loam | **Drainage Class:** | poor |
| **Taxonomy (Subgroup):** | Typic Salorthids | **Field Observations Confirm Map Type?** | No |

**PROFILE DESCRIPTION**

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle (Abundance/Contrast) | Texture, Structure, Concretions, etc. |
|---|---|---|---|---|---|
| 0-2" | fill | 10YR 4/3 | | | clayey sand |
| 2-12" | fill | 10YR 3/2 | | | clayey sand with gravel |
| 12-18" | A | 2.5Y 4/2 | gleyed | | coarse sandy loam |

**HYDRIC SOIL INDICATORS**

| | | | |
|---|---|---|---|
| ___ | Histosol | ___ | Concretions |
| ___ | Histic Epipedon | ___ | High Organic Content in Surface Layer in Sandy Soils |
| ___ | Sulfidic Odor | ___ | Organic Streaking in Sandy Soils |
| ___ | Aquic Moisture Regime | X | Listed on Local Hydric Soils List |
| ___ | Reducing Conditions | ___ | Other |
| ___ | Gleyed or Low-Chroma Colors | | |

**Remarks:** apparent fill material deposited at least on surface, sand content increases with depth, black rhizospheres and gley inclusions below 12"

## WETLAND DETERMINATION

| | | | |
|---|---|---|---|
| **Hydrophytic Vegetation Present?** | Yes | **Hydric Soils Present?** | Marginal |
| **Wetland Hydrology Present?** | Yes | **Is the Sampling Point Within a Wetland?** | Yes |

**Rationale:** Vegetation and hydrology criteria met. Marginal indicators of hydric soil conditions, but apparent fill material deposited at least on the surface.

# DATA FORM
## ROUTINE WETLAND DETERMINATION
### (1987 COE Wetlands Delineation Manual)

| | | | |
|---|---|---|---|
| **Project/Site:** | West/East Light Rail Transit Alignment | **Date:** | 5/8/98 |
| **Applicant/Owner:** | Wasatch Front Regional Council | **County:** | Salt Lake |
| **Investigator:** | Cindy Johnson/Ramona Rukavina | **State:** | Utah |
| **Do normal circumstances exist on the site?** | Yes | **Community ID:** | |
| **Is the site significantly disturbed (Atypical Situation)?** | Yes | **Transect ID:** | |
| **Is the area a potential problem area?** | No | **Plot ID:** | 12 |

VEGETATION

| | Dominant Plant Species | Stratum | Indicator | | Dominant Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|---|---|
| 1 | Distichlis spicata (100%) | H | FAC+ | 9 | | | |
| 2 | | | | 10 | | | |
| 3 | | | | 11 | | | |
| 4 | | | | 12 | | | |
| 5 | | | | 13 | | | |
| 6 | | | | 14 | | | |
| 7 | | | | 15 | | | |
| 8 | | | | 16 | | | |

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-)? 100%

Remarks: saltgrass meadow near toe of road fill slope, near marsh area

HYDROLOGY

**AVAILABLE DATA**

___ Recorded Data

Stream, Lake, or Tide Gauge ___

Aerial Photographs ___

Other ___

X No Recorded Data

**FIELD OBSERVATIONS**

Depth of Surface Water: ___ inches

Depth to Free Water in Pit: ___ inches

Depth to Saturated Soil: 0 inches

**WETLAND HYDROLOGY INDICATORS**

| Primary Indicators: | Secondary Indicators: |
|---|---|
| ___ Inundated | X Oxidized Root Zones |
| X Saturated in Upper 12" | ___ Water-Stained Leaves |
| ___ Water Marks | ___ Local Soil Survey Data |
| ___ Drift Lines | ___ FAC-Neutral Test |
| ___ Sediment Deposits | ___ Other |
| X Drainage Patterns | |

Remarks: near marsh area, soils saturated to surface

## SOILS

| | | | |
|---|---|---|---|
| **Map Unit Name (Series & Phase):** | Saltair silty clay loam | **Drainage Class:** | poor |
| **Taxonomy (Subgroup):** | Typic Salorthids | **Field Observations Confirm Map Type?** | No |

**PROFILE DESCRIPTION**

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle (Abundance/Contrast) | Texture, Structure, Concretions, etc. |
|---|---|---|---|---|---|
| 0-8" | fill | 10YR 3/2 | | | loamy sand |
| 8-12" | fill | 10YR 3/2 | 2.5Y 4/1 | scattered | loamy sand |
| 12-18" | A | 10YR 4/2 | 10YR 6/2 | scattered | silty clay |

**HYDRIC SOIL INDICATORS**

| | | | |
|---|---|---|---|
| ___ | Histosol | ___ | Concretions |
| ___ | Histic Epipedon | ___ | High Organic Content in Surface Layer in Sandy Soils |
| ___ | Sulfidic Odor | ___ | Organic Streaking in Sandy Soils |
| ___ | Aquic Moisture Regime | X | Listed on Local Hydric Soils List |
| ___ | Reducing Conditions | ___ | Other |
| ___ | Gleyed or Low-Chroma Colors | | |

**Remarks:** texture of surface soils suggest fill material, grey and black inclusions in subsurface soils

## WETLAND DETERMINATION

| | | | |
|---|---|---|---|
| **Hydrophytic Vegetation Present?** | Yes | **Hydric Soils Present?** | Marginal |
| **Wetland Hydrology Present?** | Yes | **Is the Sampling Point Within a Wetland?** | Yes |

**Rationale:** Vegetation and hydrology criteria met. Indicators of hydric soil conditions marginal, but surface textures suggest deposition of fill. Hydric soil indicators may not have developed.

# DATA FORM
# ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

| | | | |
|---|---|---|---|
| **Project/Site:** | West/East Light Rail Transit Alignment | **Date:** | 5/8/98 |
| **Applicant/Owner:** | Wasatch Front Regional Council | **County:** | Salt Lake |
| **Investigator:** | Cindy Johnson/Ramona Rukavina | **State:** | Utah |

| | | | |
|---|---|---|---|
| **Do normal circumstances exist on the site?** | Yes | **Community ID:** | |
| **Is the site significantly disturbed** (Atypical Situation)? | Yes | **Transect ID:** | |
| **Is the area a potential problem area?** | No | **Plot ID:** | 13 |

## VEGETATION

| | Dominant Plant Species | Stratum | Indicator | | Dominant Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|---|---|
| 1 | Distichlis spicata (100%) | H | FAC+* | 9 | | | |
| 2 | | | | 10 | | | |
| 3 | | | | 11 | | | |
| 4 | | | | 12 | | | |
| 5 | | | | 13 | | | |
| 6 | | | | 14 | | | |
| 7 | | | | 15 | | | |
| 8 | | | | 16 | | | |

**Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-)?** 100%

**Remarks:** on edge of open water, slightly higher elevation than water surface

## HYDROLOGY

**AVAILABLE DATA**

___ Recorded Data

- Stream, Lake, or Tide Gauge ___
- Aerial Photographs ___
- Other ___

X No Recorded Data

**FIELD OBSERVATIONS**

- Depth of Surface Water: ___ inches
- Depth to Free Water in Pit: 15 inches
- Depth to Saturated Soil: 0 inches

**WETLAND HYDROLOGY INDICATORS**

| Primary Indicators: | Secondary Indicators: |
|---|---|
| ___ Inundated | ___ Oxidized Root Zones |
| X Saturated in Upper 12" | ___ Water-Stained Leaves |
| ___ Water Marks | ___ Local Soil Survey Data |
| ___ Drift Lines | ___ FAC-Neutral Test |
| ___ Sediment Deposits | ___ Other |
| ___ Drainage Patterns | |

**Remarks:** saturated to surface, slightly higher elevation than water in pond

## SOILS

| | | | |
|---|---|---|---|
| **Map Unit Name (Series & Phase):** | Saltair silty clay loam | **Drainage Class:** | poor |
| **Taxonomy (Subgroup):** | Typic Salorthids | **Field Observations Confirm Map Type?** | No |

**PROFILE DESCRIPTION**

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle (Abundance/Contrast) | Texture, Structure, Concretions, etc. |
|---|---|---|---|---|---|
| 0-8" | fill | 10YR 3/3 | | | clayey sand |
| 8-18" | fill | 10YR 3/2 | | | clayey sand |

**HYDRIC SOIL INDICATORS**

| | | | |
|---|---|---|---|
| ___ | Histosol | ___ | Concretions |
| ___ | Histic Epipedon | ___ | High Organic Content in Surface Layer in Sandy Soils |
| ___ | Sulfidic Odor | ___ | Organic Streaking in Sandy Soils |
| ___ | Aquic Moisture Regime | X | Listed on Local Hydric Soils List |
| ___ | Reducing Conditions | ___ | Other |
| ___ | Gleyed or Low-Chroma Colors | | |

**Remarks:** texture suggests deposition of fill on surface, indicators of hydric conditions have not developed

## WETLAND DETERMINATION

| | | | |
|---|---|---|---|
| **Hydrophytic Vegetation Present?** | Yes | **Hydric Soils Present?** | No |
| **Wetland Hydrology Present?** | Yes | **Is the Sampling Point Within a Wetland?** | Yes |

**Rationale:** Vegetation and hydrology criteria conclusively met. Soil criterion not met, but texture suggests deposition of fill on surface. Indicators of hydric conditions have not developed.

# DATA FORM
## ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

| | | | |
|---|---|---|---|
| **Project/Site:** | West/East Light Rail Transit Alignment | **Date:** | 5/8/98 |
| **Applicant/Owner:** | Wasatch Front Regional Council | **County:** | Salt Lake |
| **Investigator:** | Cindy Johnson/Ramona Rukavina | **State:** | Utah |

| | | | |
|---|---|---|---|
| **Do normal circumstances exist on the site?** | Yes | **Community ID:** | |
| **Is the site significantly disturbed** (Atypical Situation)? | No | **Transect ID:** | |
| **Is the area a potential problem area?** | No | **Plot ID:** | 14 |

### VEGETATION

| | Dominant Plant Species | Stratum | Indicator | | Dominant Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|---|---|
| 1 | Distichlis spicata (70%) | H | FAC+* | 9 | | | |
| 2 | Alopecurus pratensis (35%) | H | FACW | 10 | | | |
| 3 | | | | 11 | | | |
| 4 | | | | 12 | | | |
| 5 | | | | 13 | | | |
| 6 | | | | 14 | | | |
| 7 | | | | 15 | | | |
| 8 | | | | 16 | | | |

**Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-)?** 100%

**Remarks:** south end of pond, more than 1' above water elevation

### HYDROLOGY

**AVAILABLE DATA**

___ Recorded Data
- Stream, Lake, or Tide Gauge ___
- Aerial Photographs ___
- Other ___

X No Recorded Data

**FIELD OBSERVATIONS**
- Depth of Surface Water: ___ inches
- Depth to Free Water in Pit: ___ inches
- Depth to Saturated Soil: 0 inches

**WETLAND HYDROLOGY INDICATORS**

| Primary Indicators: | Secondary Indicators: |
|---|---|
| ___ Inundated | X Oxidized Root Zones |
| X Saturated in Upper 12" | ___ Water-Stained Leaves |
| ___ Water Marks | ___ Local Soil Survey Data |
| ___ Drift Lines | ___ FAC-Neutral Test |
| ___ Sediment Deposits | ___ Other |
| X Drainage Patterns | |

**Remarks:** saturated to surface, adjacent to irrigated golf course, more than 1' above water surface elevation in adjacent pond

## SOILS

| | | | |
|---|---|---|---|
| **Map Unit Name (Series & Phase):** | Saltair silty clay loam | **Drainage Class:** | poor |
| **Taxonomy (Subgroup):** | Typic Salorthids | **Field Observations Confirm Map Type?** | |

**PROFILE DESCRIPTION**

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle (Abundance/Contrast) | Texture, Structure, Concretions, etc. |
|---|---|---|---|---|---|
| 0-18" | A | 2.5Y 2.5/1 | gley1 7/5GY | extensive | loamy clay |

**HYDRIC SOIL INDICATORS**

| | | | |
|---|---|---|---|
| ___ | Histosol | ___ | Concretions |
| ___ | Histic Epipedon | ___ | High Organic Content in Surface Layer in Sandy Soils |
| ___ | Sulfidic Odor | ___ | Organic Streaking in Sandy Soils |
| ___ | Aquic Moisture Regime | X | Listed on Local Hydric Soils List |
| ___ | Reducing Conditions | ___ | Other |
| X | Gleyed or Low-Chroma Colors | | |

**Remarks:** gleyed inclusions, extensive oxidized rhizospheres, saturated to surface

## WETLAND DETERMINATION

| | | | |
|---|---|---|---|
| **Hydrophytic Vegetation Present?** | Yes | **Hydric Soils Present?** | Yes |
| **Wetland Hydrology Present?** | Yes | **Is the Sampling Point Within a Wetland?** | Yes |

**Rationale:** All criteria met.

## DATA FORM
## ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

| | | | |
|---|---|---|---|
| **Project/Site:** | West/East Light Rail Transit Alignment | **Date:** | 5/8/98 |
| **Applicant/Owner:** | Wasatch Front Regional Council | **County:** | Salt Lake |
| **Investigator:** | Cindy Johnson/Ramona Rukavina | **State:** | Utah |

| | | | |
|---|---|---|---|
| **Do normal circumstances exist on the site?** | Yes | **Community ID:** | |
| **Is the site significantly disturbed** (Atypical Situation)? | Yes | **Transect ID:** | |
| **Is the area a potential problem area?** | No | **Plot ID:** | 15 |

### VEGETATION

| | Dominant Plant Species | Stratum | Indicator | | Dominant Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|---|---|
| 1 | Alopecurus pratensis (45%) | H | FACW | 9 | | | |
| 2 | Medicago sativa (30%) | H | NL | 10 | | | |
| 3 | Sporobolus airoides (15%) | H | FAC- | 11 | | | |
| 4 | Distichlis spicata (5%) | H | FAC+* | 12 | | | |
| 5 | Cardaria draba (5%) | H | NL | 13 | | | |
| 6 | | | | 14 | | | |
| 7 | | | | 15 | | | |
| 8 | | | | 16 | | | |

**Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-)?** 50%

**Remarks:** higher elevation than plot #14, on fill material from golf course

### HYDROLOGY

**AVAILABLE DATA**

___ Recorded Data
- Stream, Lake, or Tide Gauge ___
- Aerial Photographs ___
- Other ___

X No Recorded Data

**FIELD OBSERVATIONS**

- Depth of Surface Water: ___ Inches
- Depth to Free Water in Pit: ___ Inches
- Depth to Saturated Soil: 12 Inches

**WETLAND HYDROLOGY INDICATORS**

| Primary Indicators: | Secondary Indicators: |
|---|---|
| ___ Inundated | X Oxidized Root Zones |
| ___ Saturated in Upper 12" | ___ Water-Stained Leaves |
| ___ Water Marks | ___ Local Soil Survey Data |
| ___ Drift Lines | ___ FAC-Neutral Test |
| ___ Sediment Deposits | ___ Other |
| ___ Drainage Patterns | |

**Remarks:** saturated below 12 inches, oxidized rhizospheres only below 12 inches

# APPENDIX D
# NOISE AND VIBRATION
# DATA SHEETS

| PROJECT | ENGINEER | DATE |
|---|---|---|
| W-E LRT FEIS | T. Luc | 02/11/97 |
| **LOCATION** | | **SITE NO.** |
| 1876 W. North Temple | | 1 |

| SOUND LEVEL METER | MICROPHONE | | NOTE |
|---|---|---|---|
| LD 870 | 1/2" | | |
| **CALIBRATOR** | **CAL, dB** | **TIME** | |
| LD CA 250 | 114 | 06:48A | |
| **METER SETTING** | | | |
| A-WEIGHTED; SLOW | | | |

| TIME START | TIME END | L1 | L10 | L25 | L50 | L90 | L99 | LMIN | LMAX | Leq | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 06:52A | 07:08A | 77.2 | 68.2 | 66 | 63.9 | 59.8 | 58.1 | 56.8 | 83.7 | 66.7 | 1 aircraft flyover |
| | | | | | | | | | | | |
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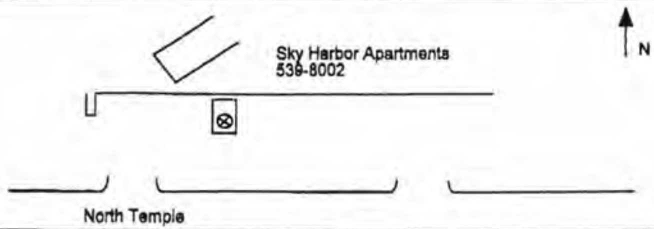
SKETCH




PARSONS ENGINEERING SCIENCE, INC.

| PROJECT | ENGINEER | DATE |
|---|---|---|
| W-E LRT FEIS | T. LUC | 02/11/97 |

| LOCATION | SITE NO. |
|---|---|
| MOBILE HOMES - 1300 WEST | 2 |

| SOUND LEVEL METER | MICROPHONE | NOTE |
|---|---|---|
| LD 870 | 1/2" | |

| CALIBRATOR | CAL. dB | TIME |
|---|---|---|
| LD CA 250 | 114 | |

| METER SETTING |
|---|
| A-WEIGHTED; SLOW |

| TIME START | TIME END | L1 | L10 | L33 | L50 | L90 | L99 | LMIN | LMAX | Leq | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 07:18A | 07:45A | 72.8 | 69.6 | 68.4 | 67 | 62.8 | 59.1 | 57.7 | 77.9 | 67.4 | 1 heavy truck with engine idling at 50' |
| | | | | | | | | | | | |
| 07:45A | 07:50A | 69.5 | 67.8 | 66.4 | 64.8 | 60.8 | 56.1 | 55.9 | 70.8 | 65.2 | |
| 16:47 | 17:07 | 69.8 | 66.7 | 65.3 | 63.3 | 56.9 | 52.3 | 51 | 76.6 | 64.1 | |
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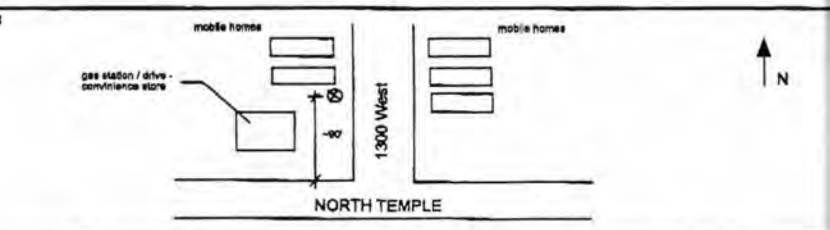
SKETCH




PARSONS ENGINEERING SCIENCE, INC.

| PROJECT | ENGINEER | DATE |
|---|---|---|
| W-E LRT FEIS | A. GHARABEGIAN | 02/11/97 |

| LOCATION | SITE NO. |
|---|---|
| 62 10th WEST ST, SALT LAKE, UT | 3 |

| SOUND LEVEL METER | MICROPHONE | NOTE |
|---|---|---|
| LD 870 | 1/2" | |

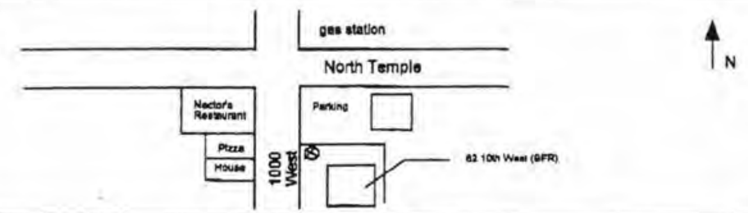
| CALIBRATOR | CAL, dB | TIME |
|---|---|---|
| LD CA 250 | 114 | |

METER SETTING

A-WEIGHTED; SLOW

| TIME START | TIME END | L1 | L10 | L25 | L50 | L90 | L99 | LMIN | LMAX | Leq | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 07:20A | 07:40A | 74.5 | 68.5 | 64.8 | 62.8 | 58.1 | 54.4 | 53.4 | 84.1 | 65.3 | 1 pickup truck - with pile of metal touching ground - went by |
| 04:50P | 05:05P | 70.5 | 66.4 | 64.9 | 63.3 | 59.1 | 54.7 | 53.4 | 73.8 | 64 | |

SKETCH



| PROJECT | ENGINEER | DATE |
|---|---|---|
| W-E LRT FEIS | T. LUC | 02/11/97 |

| LOCATION | SITE NO. |
|---|---|
| 776 W. NORTH TEMPLE, SALT LAKE, UT | 4 |

| SOUND LEVEL METER | MICROPHONE | NOTE |
|---|---|---|
| LD 870 | 1/2" | AM PEAK - EB<br>PM PEAK - WB |

| CALIBRATOR | CAL. dB | TIME |
|---|---|---|
| LD CA 250 | 114 | |

METER SETTING

A-WEIGHTED; SLOW

| TIME START | TIME END | L1 | L10 | L25 | L50 | L90 | L99 | LMIN | LMAX | Leq | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 07:55A | 08:10A | 76.2 | 71.9 | 69.7 | 67.4 | 62.4 | 60.2 | 58.9 | 79.2 | 68.8 | <-- train |
| 16:14 | 16:30 | 75.2 | 69.7 | 67.6 | 65 | 57.9 | 55 | 52.9 | 79.6 | 66.6 | <-- aircraft flyover |
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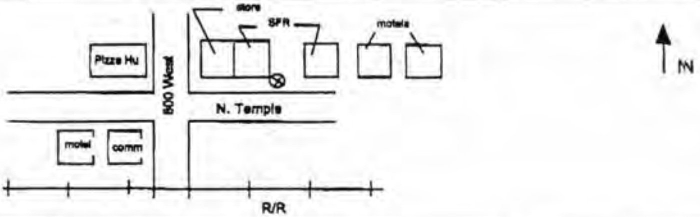


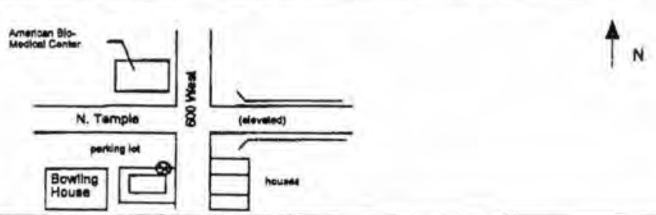

PARSONS ENGINEERING SCIENCE, INC.

| PROJECT | ENGINEER | DATE |
|---|---|---|
| W-E ILRT FEIS | A. GHARABEGIAN | 02/11/97 |
| **LOCATION** | | **SITE NO.** |
| 67 600 WEST, SALT LAKE, UT | | 5 |

| SOUND LEVEL METER | MICROPHONE | | NOTE |
|---|---|---|---|
| LD 870 | 1/2" | | |
| **CALIBRATOR** | **CAL, dB** | **TIME** | |
| LD CA 250 | 114 | | |
| **METER SETTING** | | | |
| A-WEIGHTED; SLOW | | | |

| TIME START | TIME END | L1 | L10 | L33 | L50 | L90 | L99 | LMIN | LMAX | Leq | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7:558A | 8:15A | 72.7 | 66.9 | 47.1 | 64.7 | 59.6 | 58.1 | 56.6 | 74.2 | 65.9 | |
| 4:15P | 4:35P | 71.3 | 68.2 | 66.7 | 64.6 | 59.9 | 56.6 | 56 | 76.2 | 65.4 | |

SKETCH




PARSONS ENGINEERING SCIENCE, INC.

| PROJECT | ENGINEER | DATE |
|---|---|---|
| W-E LRT FEIS | T. LUC | 02/10/97 |

| LOCATION | SITE NO. |
|---|---|
| PIONEER PARK, NE OF 4TH SOUTH & 4TH WEST | 6 |

| SOUND LEVEL METER | MICROPHONE | NOTE |
|---|---|---|
| LD 870 | 1/2" | |

| CALIBRATOR | CAL. dB | TIME |
|---|---|---|
| LD CA 250 | 114 | |

| METER SETTING |
|---|
| A-WEIGHTED; SLOW |

| TIME START | TIME END | L1 | L10 | L25 | L50 | L90 | L99 | LMIN | LMAX | Leq | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 16:54 | 17:19 | 69.6 | 65 | 61.9 | 59.3 | 56.3 | 55 | 54.8 | 72.2 | 61.6 | |
| 8:34A | 8:51A | 73.1 | 66.7 | 61.9 | 58.8 | 56.6 | 55.5 | 54.8 | 75.8 | 62.6 | |
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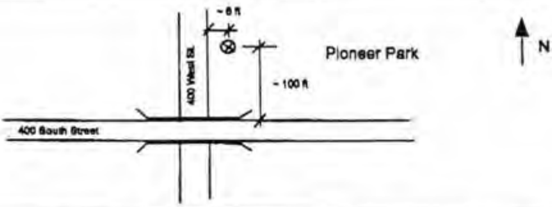


PARSONS ENGINEERING SCIENCE, INC.

| PROJECT | ENGINEER | DATE |
|---|---|---|
| W-E LRT FEIS | T. LUC | 02/10/97 |

| LOCATION | SITE NO. |
|---|---|
| COURTYARD - MARRIOTT 130 4TH SOUTH | 7 |

| SOUND LEVEL METER | MICROPHONE | | NOTE |
|---|---|---|---|
| LD 870 | 1/2" | | |
| CALIBRATOR | CAL. dB | TIME | |
| LD CA 250 | 114 | | |
| METER SETTING | | | |
| A-WEIGHTED; SLOW | | | |

| TIME START | TIME END | L1 | L10 | L25 | L50 | L90 | L99 | LMIN | LMAX | Leq | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 16:11 | 16:41 | 73.7 | 69.9 | 67.4 | 64.8 | 60.6 | 58.1 | 56.9 | 80.2 | 66.6 | receptor's approx. 4' above street surface |
| 8:59A | 9:15A | 76.7 | 69.8 | 67.2 | 64.6 | 60.7 | 58.1 | 57.2 | 79 | 66.7 | speed – 35-40 mph |
| | | | | | | | | | | | 3 lanes on ea. side of 4th South |
| | | | | | | | | | | | |
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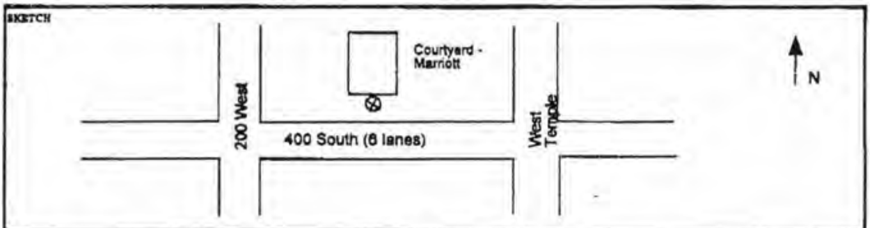


PARSONS ENGINEERING SCIENCE, INC.

| PROJECT | ENGINEER | DATE |
|---|---|---|
| W-E LRT FEIS | A. GHARABEGIAN | 02/10/97 |

| LOCATION | SITE NO. |
|---|---|
| PARK IN FRONT OF CITY HALL | 8 |

| SOUND LEVEL METER | MICROPHONE | NOTE |
|---|---|---|
| LD 870 | 1/2" | |

| CALIBRATOR | CAL, dB | TIME |
|---|---|---|
| LD CA 250 | 114 | |

METER SETTING

A-WEIGHTED; SLOW

| TIME START | TIME END | L1 | L10 | L35 | L50 | L90 | L99 | LMIN | LMAX | Leq | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 16:15 | 16:35 | 68.5 | 65.3 | 63.8 | 62.2 | 59.4 | 57.6 | 57 | 74.4 | 63 | |
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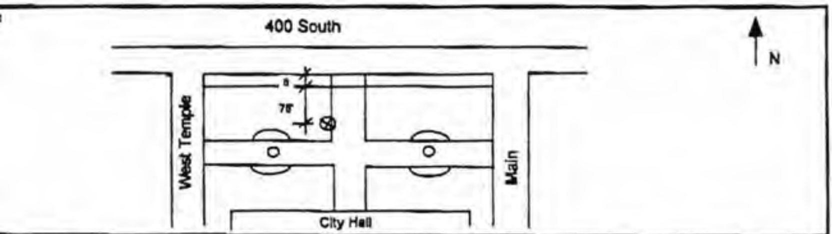
SKETCH




PARSONS ENGINEERING SCIENCE, INC.

| PROJECT | ENGINEER | DATE |
|---|---|---|
| W-E LRT FEIS | A. GHARABEGIAN | 02/10/97 |

| LOCATION | SITE NO. |
|---|---|
| 938 E. 400 SOUTH, SALT LAKE CITY | 9 |

| SOUND LEVEL METER | MICROPHONE | NOTE |
|---|---|---|
| LD 870 | 1/2" | |

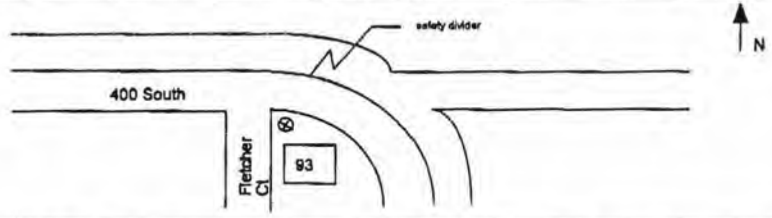
| CALIBRATOR | CAL. dB | TIME |
|---|---|---|
| LD CA 250 | 114 | |

METER SETTING

A-WEIGHTED; SLOW

| TIME START | TIME END | L1 | L10 | L25 | L50 | L90 | L99 | LMIN | LMAX | Leq | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 16:21 | 16:38 | 76.1 | 73.2 | 71.1 | 67.2 | 57.3 | 53.1 | 52 | 81.5 | 69.2 | 2/10/97 |
| 07:34 | 07:49 | 79.6 | 73.6 | 71.7 | 67.7 | 59.1 | 56.4 | 54.7 | 88 | 70.6 | 2/11/97 |

SKETCH




PARSONS ENGINEERING SCIENCE, INC.

| PROJECT | ENGINEER | DATE |
|---|---|---|
| W-E LRT FEIS | T. LUC | 02/10/97 |

| LOCATION | SITE NO. |
|---|---|
| 1121 E. 5TH SOUTH, SALT LAKE, UT | 10 |

| SOUND LEVEL METER | | MICROPHONE | | NOTE |
|---|---|---|---|---|
| LD 870 | | 1/2" | | |
| CALIBRATOR | CAL, dB | | TIME | |
| LD CA 250 | 114 | | | |
| METER SETTING | | | | |
| A-WEIGHTED; SLOW | | | | |

| TIME START | TIME END | L1 | L10 | L33 | L50 | L90 | L99 | LMIN | LMAX | Leq | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 15:18 | 15:44 | 74.3 | 71.6 | 69.2 | 65.8 | 55.4 | 49.6 | 45.6 | 77.4 | 67.6 | Noise level's in the mid to high 40's when there is no traffic (pm) |
| 7:31A | 07:55 | 75.8 | 73 | 70.8 | 68.3 | 61.9 | 57.3 | 56.4 | 78.1 | 69.7 | slight up-grade toward eastbound |
| | | | | | | | | | | | Lp goes to ~75 dBA when heavy trucks go by |
| | | | | | | | | | | | Traffic lights at 6th South and 1100 East |
| | | | | | | | | | | | Speed ~35-45 mph |
| | | | | | | | | | | | |
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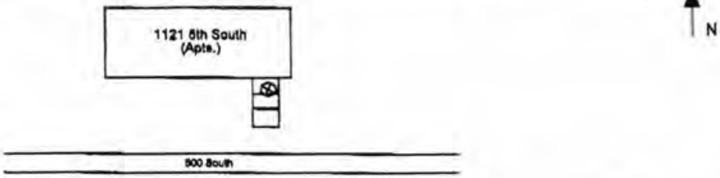
SKETCH

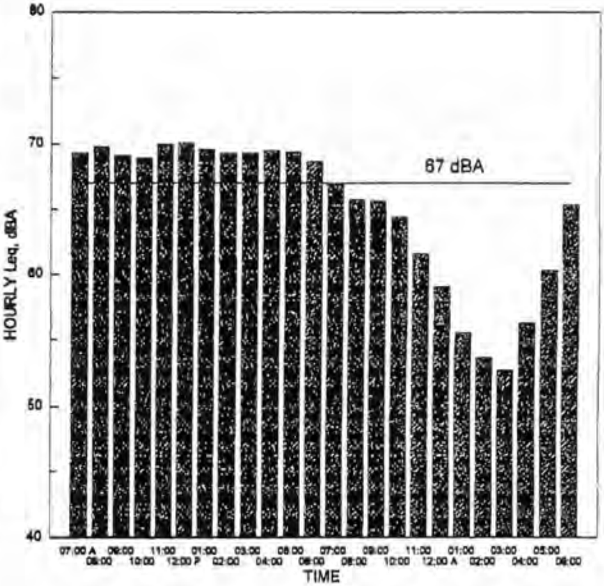



PARSONS ENGINEERING SCIENCE, INC.

# Table A-1. Summary of 24-Hour Noise Measurement

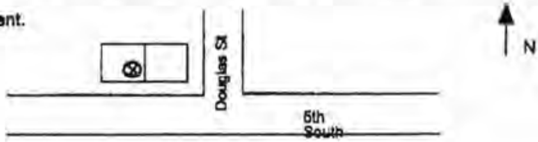
| | |
|---|---|
| Location: | Site 11, 480 S. Douglas Street, Salt Lake, UT 84102 |
| Position: | Residential, deck on top of garage |
| Sources: | Traffic on 5th South |
| Date: | February 10 - 11, 1997 |

| *TIME* | *Leq, dBA* |
|---|---|
| 07:00 - 08:00 AM | 69.3 |
| 08:00 - 09:00 AM | 69.8 |
| 09:00 - 10:00 AM | 69.1 |
| 10:00 - 11:00 AM | 68.9 |
| 11:00 AM - 12:00 PM | 70.0 |
| 12:00 - 01:00 PM | 70.1 |
| 01:00 - 02:00 PM | 69.6 |
| 02:00 - 03:00 PM | 69.3 |
| 03:00 - 04:00 PM | 69.3 |
| 04:00 - 05:00 PM | 69.5 |
| 05:00 - 06:00 PM | 69.4 |
| 06:00 - 07:00 PM | 68.6 |
| 07:00 - 08:00 PM | 66.9 |
| 08:00 - 09:00 PM | 65.8 |
| 09:00 - 10:00 PM | 65.7 |
| [redacted] | |
| | 70.2 |




**NOTES:**

24-hour ambient noise measurement.




NOT TO SCALE

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PARSONS ENGINEERING SCIENCE, INC.

| PROJECT | ENGINEER | DATE |
|---|---|---|
| W-E LRT FEIS | T. LUC | 02/11/97 |

| LOCATION | SITE NO. |
|---|---|
| UNIV. ST/ BETWEEN 400 AND 500 SOUTH, SALT LAKE, UT | 12 |

| SOUND LEVEL METER | MICROPHONE | NOTE |
|---|---|---|
| LD 870 | 1/2" | |

| CALIBRATOR | CAL, dB | TIME |
|---|---|---|
| LD CA 250 | 114 | |

METER SETTING

A-WEIGHTED; SLOW

| TIME START | TIME END | L1 | L10 | L25 | L50 | L90 | L99 | LMIN | LMAX | Leq | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 15:30 | 15:45 | 68.3 | 60.7 | 56.4 | 53.1 | 48.7 | 46.3 | 45.8 | 71 | 57.6 | |
| 07:59A | 8:14A | 66.8 | 63.8 | 59.4 | 56.2 | 51.3 | 49.5 | 49.1 | 74.9 | 59.7 | |
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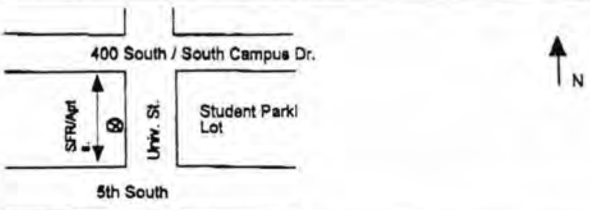
SKETCH




PARSONS ENGINEERING SCIENCE, INC.

| PROJECT | ENGINEER | DATE |
|---|---|---|
| W--E LRT FEIS | T. LUC | 02/11/97 |

| LOCATION | SITE NO. |
|---|---|
| U (OF UTAH STUDENT APTS - WEST VILLAGE - BLDG C | 13 |

| SOUND LEVEL METER | MICROPHONE | NOTE |
|---|---|---|
| LD) 870 | 1/2" | |

| CALIBRATOR | CAL, dB | TIME |
|---|---|---|
| LD) CA 250 | 114 | |

| METER SETTING |
|---|
| A-WEIGHTED; SLOW |

| TIME START | TIME END | L1 | L10 | L25 | L50 | L90 | L99 | LMIN | LMAX | $L_{eq}$ | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 115:02 | 15:21 | 64.4 | 59.6 | 57.6 | 55.4 | 48.6 | 46.5 | 44.6 | 70.2 | 56.8 | |
| 18:30A | 8:45A | 64.6 | 60.1 | 58.3 | 56.5 | 51.4 | 45.2 | 44 | 70.7 | 57.8 | |
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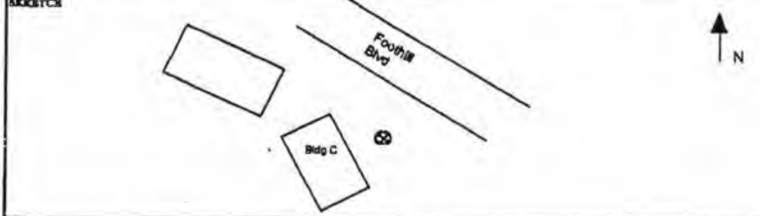


PARSONS ENGINEERING SCIENCE, INC.

| PROJECT | | ENGINEER | DATE |
|---|---|---|---|
| W-E LRT FEIS | | M. HALE | 07/08/97 |
| LOCATION | | | SITE NO. |
| SW CORNER OF 400 SOUTH 800 EAST (NORTH SIDE OF LDS 10TH WARD BUILDING) | | | 14 |

| SOUND LEVEL METER | MICROPHONE | NOTE |
|---|---|---|
| LD 870 | 1/2" | |

| CALIBRATOR | CAL. dB | TIME |
|---|---|---|
| LD CA 250 | 114 | |

METER SETTING

A-WEIGHTED; SLOW

| TIME START | TIME END | L1 | L10 | L33 | L50 | L90 | L99 | LMIN | LMAX | Leq | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4:45P | 5:00P | 81.4 | 74.9 | 72 | 67.4 | 59.3 | 54.4 | 52.2 | 85.3 | 71.6 | |
| | | | | | | | | | | | |
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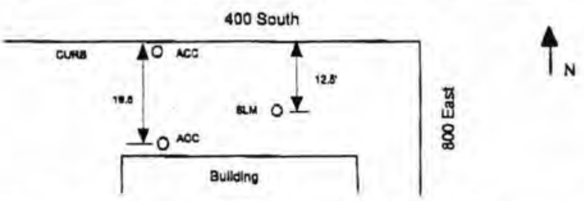
SKETCH




PARSONS ENGINEERING SCIENCE, INC.

| PROJECT | ENGINEER | DATE |
|---|---|---|
| W-E LRT FEIS | M. HALE | 07/08/97 |

| LOCATION | SITE NO. |
|---|---|
| 1272 EAST 400 SOUTH | 15 |

| SOUND LEVEL METER | MICROPHONE | NOTE |
|---|---|---|
| LD 870 | 1/2" | |

| CALIBRATOR | CAL, dB | TIME |
|---|---|---|
| LD CA 250 | 114 | |

| METER SETTING |
|---|
| A-WEIGHTED; SLOW |

| TIME START | TIME END | L1 | L10 | L25 | L50 | L90 | L99 | LMIN | LMAX | Leq | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5:15P | 5:30P | 76.5 | 72.8 | 69.7 | 64.9 | 61.3 | 60 | 59.6 | 79.8 | 68.8 | |
| | | | | | | | | | | | |
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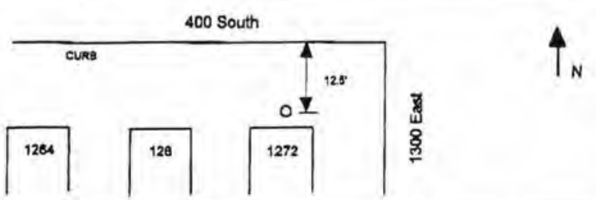



PARSONS ENGINEERING SCIENCE, INC.

| PROJECT | ENGINEER | DATE |
|---|---|---|
| W-E LRT FEIS | M. HALE | 07/08/97 |

| LOCATION | SITE NO. |
|---|---|
| HUNTSMAN CENTER ON SOUTH CAMPUS DRIVE | 16 |

| SOUND LEVEL METER | MICROPHONE | NOTE |
|---|---|---|
| LD 870 | 1/2" | |

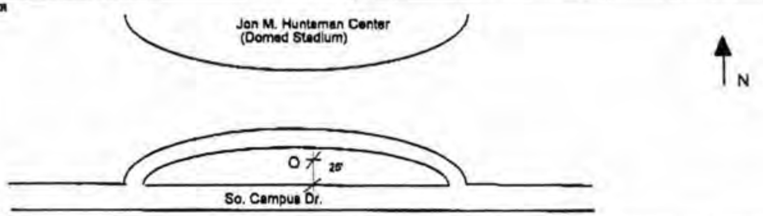
| CALIBRATOR | CAL. dB | TIME |
|---|---|---|
| LD CA 250 | 114 | |

METER SETTING

A-WEIGHTED; SLOW

| TIME START | TIME END | L1 | L10 | L33 | L50 | L90 | L99 | LMIN | LMAX | Leq | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12:00P | 12:15P | 72.4 | 66.8 | 63.6 | 60.6 | 52.3 | 48.5 | 47.6 | 74.8 | 63.1 | |

SKETCH




PARSONS ENGINEERING SCIENCE, INC.

| PROJECT | ENGINEER | DATE |
|---|---|---|
| W-E LRT FEIS | M. HALE | 07/08/97 |

| LOCATION | SITE NO. |
|---|---|
| MEDICAL DRIVE AT MEDICAL DRIVE SOUTH | 17 |

| SOUND LEVEL METER | MICROPHONE | NOTE |
|---|---|---|
| LD 870 | 1/2" | |

| CALIBRATOR | CAL, dB | TIME |
|---|---|---|
| LD CA 250 | 114 | |

METER SETTING

A-WEIGHTED; SLOW

| TIME START | TIME END | L1 | L10 | L25 | L50 | L90 | L99 | LMIN | LMAX | Leq | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11:20A | 11:35A | 72.8 | 67 | 64.2 | 61.1 | 54.8 | 50.4 | 49.5 | 78.3 | 63.8 | |
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PARSONS ENGINEERING SCIENCE, INC.

| PROJECT | ENGINEER | DATE |
|---|---|---|
| W-E LRT FEIS | M. HALE | 8/13/98 |

| LOCATION | SITE NO. |
|---|---|
| U of U FIELD HOUSE | 18 |

| SOUND LEVEL METER | MICROPHONE | NOTE |
|---|---|---|
| LD 870 | 1/2" | |

| CALIBRATOR | CAL, dB | TIME |
|---|---|---|
| LD CA 250 | 114 | |

METER SETTING

A-WEIGHTED; SLOW

| TIME START | TIME END | L1 | L10 | L25 | L50 | L90 | L99 | LMIN | LMAX | Leq | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10:45 | 11:00 | 86.3 | 83.3 | 81.6 | 80.2 | 79.2 | 79 | 78.8 | 87.2 | 81.2 | Stadium Area Construction Noise |
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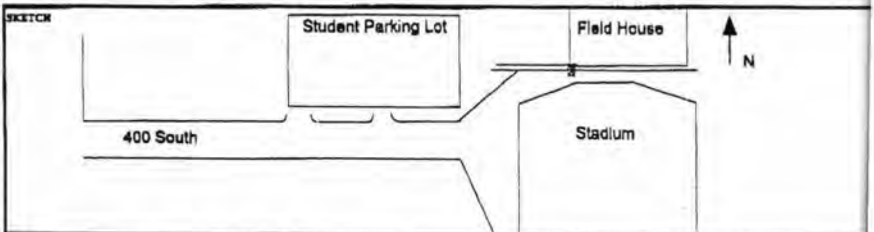


PARSONS ENGINEERING SCIENCE, INC.

| PROJECT<br>W-E LRT FEIS | ENGINEER<br>M. HALE | DATE<br>8/13/98 |
|---|---|---|
| LOCATION<br>NEW COURTHOUSE | | SITE NO.<br>19 |

| SOUND LEVEL METER<br>LD 870 | | MICROPHONE<br>1/2" | NOTE |
|---|---|---|---|
| CALIBRATOR<br>LD CA 250 | CAL, dB<br>114 | TIME | |
| METER SETTING<br>A-WEIGHTED; SLOW | | | |

| TIME START | TIME END | L1 | L10 | L25 | L50 | L90 | L99 | LMIN | LMAX | Leq | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 08:16 | 08:30 | 77.7 | 71.6 | 69.9 | 67.1 | 63.1 | 60.4 | 59.7 | 82.8 | 69.2 | |
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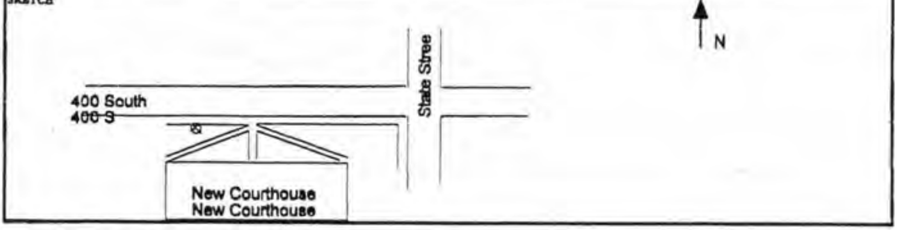



PARSONS ENGINEERING SCIENCE, INC.

| PROJECT | ENGINEER | DATE |
|---|---|---|
| W-E LRT FEIS | M. HALE | 8/13/98 |

| LOCATION | SITE NO. |
|---|---|
| EXCHANGE PLACE DISTRICT | 20 |

| SOUND LEVEL METER | MICROPHONE | NOTE |
|---|---|---|
| LD 870 | 1/2" | |

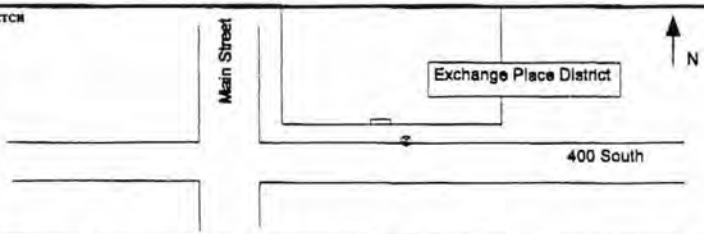
| CALIBRATOR | CAL, dB | TIME |
|---|---|---|
| LD CA 250 | 114 | |

METER SETTING

A-WEIGHTED; SLOW

| TIME START | TIME END | L1 | L10 | L33 | L50 | L90 | L99 | LMIN | LMAX | Leq | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 07:15 | 07:30 | 78.6 | 75.4 | 72.9 | 69.2 | 62.6 | 60.5 | 59.9 | 81.4 | 71.5 | |
| 17:00 | 17:15 | 81.9 | 76.3 | 73.4 | 70.8 | 63.5 | 59.3 | 58.6 | 88.6 | 73.2 | |

SKETCH




PARSONS ENGINEERING SCIENCE, INC.

| PROJECT | ENGINEER | DATE |
|---|---|---|
| W-E LRT FEIS | M. HALE | 8/13/98 |

| LOCATION | SITE NO. |
|---|---|
| FEDERAL COURTHOUSE | 21 |

| SOUND LEVEL METER | MICROPHONE | NOTE |
|---|---|---|
| LD 870 | 1/2" | |

| CALIBRATOR | CAL. dB | TIME |
|---|---|---|
| LD CA 250 | 114 | |

| METER SETTING |
|---|
| A-WEIGHTED; SLOW |

| TIME START | TIME END | L1 | L10 | L33 | L50 | L90 | L99 | LMIN | LMAX | Leq | NOTES |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 16:15 | 16:30 | 82.2 | 75.8 | 73.1 | 69.7 | 61.8 | 58 | 56.1 | 88.6 | 72.6 | Bus Stop |
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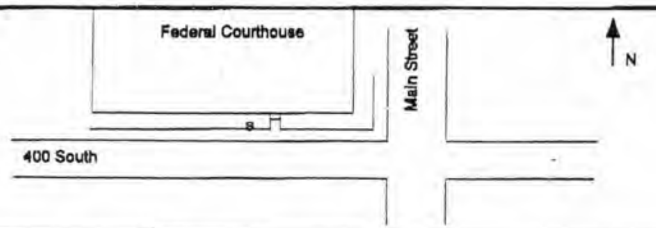


PARSONS ENGINEERING SCIENCE, INC.

# APPENDIX E
# PHASE I
# ENVIRONMENTAL SITE ASSESSMENT

# SECTION 1.0

# INTRODUCTION

## 1.1 INTRODUCTION

Parsons Engineering Science Inc., (Parsons ES) was retained by Parsons Transportation Group (PTG) to perform a Phase I Environmental Site Assessment (ESA) according to American Society of Testing Materials (ASTM E1527-97) for the Salt Lake City International Airport to the University of Utah (West-East) Corridor FEIS located in Salt Lake City, Utah. Construction and operation of light rail transit (LRT) route will be completed from the Salt Lake City International Airport to approximately 2500 West to North Temple Street to 400 West Street where it will continue south to 400 South Street. Then the LRT FEIS Study Corridor continues east to 900 East Street, it will veer south to 500 South, and at 1300 East it will turn north to 400 East where it will continue along South Campus Drive to Wasatch Boulevard, continuing northward to the University of Utah Hospital (Figure 1.1).

The LRT right-of-way (ROW) is shown on the Salt Lake County Plat maps, and is located in Salt Lake City, Salt Lake County, Utah. North Temple Street (100 North) and 400 South Streets are currently state designated routes.

## 1.2 PURPOSE, LIMITATIONS AND EXCEPTIONS OF ASSESSMENT

The purpose of this ESA is to identify any environmental concerns adjacent to the LRT alignment that could result in potentially contaminated sources. This site assessment has been focused within the location of the LRT ROW for the length of the alignment, and additional parcels near the alignment that may be of potential concern. The information provided in the title search of selected properties do not contain references to the ROW. However, references are made to the parcels which border the ROW, and deeds are included in Appendix A for two locations.

The Phase I Site Assessment Report is based on the review of documents and aerial photographs supplied by the Salt Lake County Recorders Office, Olympus Aerial Survey's, Inc., University of Utah Library, Utah Department of Environmental Quality, Division of Environmental Response and Remediation, Wasatch Front Regional Council, and Parsons Transportation Group. The following lists were also reviewed for any possible references: RCRIS Master Facility List, CERCLIS Site/Event Listing, Utah Registered UST List, Utah LUST List, Utah Landfill Inventory, EPA National Superfund Priority List Sites, ERNS, DOCKETS, PADS, TRIS, CORRACTS, and FINDS. United States Geological Survey (USGS) 7.5' Quadrangle maps of Salt Lake City, North, and Fort Douglas, Utah, were reviewed to determine surficial gradient of the alignment, and the reference locations of surface water. Sanborn Fire Insurance maps of the alignment were reviewed for the years of 1889, 1911, 1937, and 1950, to determine facility types and past owners. The Polk city directory of Salt Lake City, Utah was reviewed for the years 1920, 1939, 1950, 1960 1970, and 1981 to determine property owners and whether the property was residential or commercial during each time period. A site visit of all properties was conducted to field check the data obtained from many different sources, and locate features that may provide information concerning the presence or absence of contamination at the site. Aerial photographs of Salt Lake City were reviewed from the years 1952, 1958, and 1985, and others were obtained from 1936 of the Salt Lake City Municipal Airport, and surrounding area.. Copies of contact prints from 1958, and 1985 are included in Appendix B, along with selected enlargements. Copies of selected documents from the Utah Department of Environmental Quality (DEQ) Division of Environmental Response and Remediation (DERR) were reviewed and copied if applicable information was located. The following documents were reviewed: Leaking underground storage tank (LUST), underground storage tank (UST), and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

## 1.3 LIMITING CONDITIONS AND METHODOLOGY

No environmental sampling, testing, or chemical analysis were performed during the Phase I site assessment as specified by the scope of work. In many cases, Parsons ES relied on the associated documentation provided regarding past and present operations at adjacent sites. This report depends on the accuracy and completeness of the information provided to Parsons ES by the DEQ-DERR; written information obtained through PTG, The University of Utah Library, aerial photographs, and regulatory databases.

This report has been divided into six sections including this introduction. Section 2 describes site and vicinity characteristics and reports past uses of facilities adjacent to the alignment parcel, to the extent known. Section 3 is a record review which includes standard environmental record sources and historical use information. Section 4 includes information derived from reconnaissance of adjacent properties and the interviews, to the extent possible. Section 5 reports the findings, recommendations, and conclusions. Section 6 contains a bibliography. Appendix A contains selected deeds from the Salt Lake County Recorders Office. Appendix B contains copies of selected aerial photographs of the alignment from 1958 and 1985. Appendix C contains the Site Assessment Special Report prepared by Vista Information Solutions, Inc., and Appendix D contains a listing of all properties of potential concern collected from the Polk City Directory for Salt Lake City, Utah from 1920 to 1998.

# SECTION 2.0

# SITE DESCRIPTION

## 2.1 LOCATION

The proposed light rail transit alignment begins at the Salt Lake City International Airport (SLCIA), and heads south along Terminal Drive until it encounters I-80. It follows the north side of I-80 and SLCIA access roads until approximately 2500 West Street where it heads north to North Temple Street. It continues east on North Temple Street to 400 West. Then the LRT alignment turns south and intersects with 400 South Street. At 400 South it continues east to 900 East where it veers south to 500 South Street. It follows 500 South until it encounters 1300 East Street. Here it turns north to 400 South and then east along 400 South to South Campus Drive. It continues along South Campus Drive until the intersection of Wasatch Drive. At Wasatch Drive it continues northward to end on Medical Drive near the University Hospital. The relationship of the alignment to the surrounding Salt Lake City property is indicated on Figure 1.1.

## 2.2 PARCEL AND VICINITY CHARACTERISTICS

The alignment is located across Salt Lake City from the southern edge of the Great Salt Lake wetlands to the foothills of the Wasatch Front. The surface is relatively flat from the SLCIA to approximately 800 East Street where it begins to rise abruptly. At 1300 East Street the land surface begins to level out and the rise is not as steep, until its terminus near the University of Utah Hospital. The West-East LRT Alignment extends approximately 11.2 miles The subsurface geology ranges from varying deltaic environments. The soils in the vicinity of the SLCIA are comprised of filled land, (where fill material has been emplaced on the native soil) silts, and clays, underlain by deltaic and reworked deltaic deposits composed of silt, sand and minor amounts of gravel. The shallow subsurface groundwater table ranges from 0 to 10 feet below ground surface (bgs). The soils which comprise the near surface environment, as we approach 400 West consist mainly of fill underlain by silt and clay, and further underlain by sand and fine to coarse deltaic gravels. Depth to groundwater in this area is approximately 5 to 10 feet below ground surface. As the LRT alignment approaches the University of Utah the subsurface becomes poorly sorted and contains an unequal mixture of sand, silt, fine to coarse gravels, and medium to large pebbles, and cobbles. The groundwater in this area is much deeper and is estimated at 100 feet or greater below ground surface. As we continue to the east, the underlying sediments give way to a thin coating of sediments overlying bedrock. In fact, in some areas of Fort Douglas the depth to bedrock is less than 20 feet.

Figure 1.1

## 2.3 DESCRIPTION OF STRUCTURES, ROADS AND OTHER IMPROVEMENTS ON THE SITE

The alignment will be located in the middle of North Temple Street for both directions of travel. The alignment is intersected by many streets, crosses over the Jordan River at approximately 1400 West North Temple, crosses a large number of railroad tracks on a overpass at 600 West to 400 West, crosses a set of light rail tracks at 400 east and continues uphill to the University of Utah, where it will go into a tunnel and appear on South Campus Drive. It will continue on South Campus Drive until Wasatch Boulevard is encountered, where it will turn to the north until it reaches the University of Utah Hospital.

The utilities present along the alignment include water, sanitary and storm sewer, telephone, and the City Creek Viaduct.

## 2.4 CURRENT USES OF THE PROPERTY

The roadways that will encompass the proposed LRT alignment are currently used for transportation and commerce.

## 2.5 PAST USES OF THE PROPERTY

The LRT alignment roadways were used for transportation and commerce since the mid 1800's.

## 2.6 CURRENT AND PAST USES OF ADJOINING PROPERTIES

Numerous business, commercial and retail, manufacturing facilities and residences are located along the length of the LRT alignment. Some of the commercial facilities have been used for the manufacture/storage/dispensing of paints, missle guidance systems, electric motors, carriages, ice cream, diesel locomotives, equipment, coal gas, and gasoline. Many residences are located from approximately 400 West to the intersection of 1400 East. However, interspersed within the residences are gasoline service stations, restaurants, and other businesses.

# SECTION 3.0

# REGULATORY AGENCY REVIEW

## 3.1 REVIEW OF AGENCY LISTS

Parsons ES retained the services of a search company, VISTA, Inc., to review several applicable regulatory lists of known hazardous waste sites. Parsons ES personnel reviewed other applicable lists for additional information. This was necessary to identify sites located within 300 linear feet of the alignment. This review is summarized by the specific agency list below. The report by VISTA Information Solutions, Inc., is provided as Appendix C.

The following list indicates the Standard Environmental Record Sources that were reviewed.

### *A. CORRACTS (RCRA Corrective Action)*

The Environmental Protection Agency maintains the CORRACTS database to provides information on RCRA sites where corrective action is taking place. A corrective action order is issued when there has been a release into the environment from a RCRA facility according to RCRA Section 3008 (h). Corrective actions may be required beyond the facility's boundary, and can be required regardless of when the release occurred, even if it predates RCRA. The following site was located within 300 feet of the LRT alignment:

- American Barrel Company, 600 West North Temple Street

### *B. GNRTR (RCRA registered small or large generators of hazardous waste)*

The GNRTR is a collection of 3 separate databases including RCRA TSD, RCRA Small Quantity Generator, and RCRA Large Quantity Generator the results include selected information on sites that generate, store, treat, or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act. RCRA large quantity generators are facilities which generate at least 1000 kilograms (kg) per month of non-acutely hazardous waste or 1 kg/month of acutely hazardous waste. RCRA Small and Very Small generators are facilities which generate less than 1000 kg/month of non-acutely hazardous waste. The following facilities were listed and are located within approximately 300 feet of the LRT alignment:

- American Barrel Company, 600 West North Temple Street
- Mountain Fuel-Salt Lake North Operations Center, 1000 West First North

- Hertz Corporation, 3757 West Terminal Road
- Barken International, Salt Lake City International Airport
- Chevron Salt Lake Airport Pipeline Delivery, Salt Lake City International Airport
- David Early Tire, 875 West North Temple
- David Early Tires, 378 South West Temple
- Ronald Kinyon Chevron, 880 West North Temple
- Artistic Printing Company, 377 West 100 South
- Commercial Body and Paint, 321 West 400 South
- Minit-Lube #1020, 757 West North Temple
- Minit Lube #1042, 677 East 400 South
- Jiffy Lube 804 East 400 South
- St. Regis/Champion International, 1881 West North Temple
- Phillips Petroleum Co SS #7092, 873 East 400 South
- Red Hanger #12, 955 West North Temple
- Utah Power and Light Gadsby Plant, 1359 West North Temple
- U S West Communications, 1550 West North Temple
- Union Pacific Railroad Company, 400 West South Temple
- Screenprint Design Inc., 378 West 300 South
- Chevron USA #77152 Chris Keith, Inc., 351 South West Temple
- University of Utah, Safety Services Building 301

***C. Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Site/Event Listing dated 2 February 1995, Source: United States Environmental Protection Agency.***

The CERCLIS database contains information on sites identified by the USEPA as known, suspected abandoned, inactive, or uncontrolled hazardous waste sites that may require cleanup. The list is compiled by the EPA for determination as to whether the site should be included as an

NPL. The following sites were indicated on the CERCLIS list and are located within 300 feet of the LRT alignment:

- Utah Power and Light/American Barrel Company, 600 West South Temple Street
- Jacobson Drums, 1925 West North Temple
- Barber Company Tar Products, 1100 West North Temple
- South Temple Landfill, 55 South Redwood Road

***D. Utah Registered Underground Storage Tank (UST) List dated January 1998, Source: Utah Department of Environmental Quality Division of Environmental Response and Remediation.***

The registered underground storage tank list includes a list of all the known registered underground storage tanks in Utah. Underground storage tanks are regulated under Subtitle I, Section 9002 of RCRA. A review of the list indicated seventy three locations within 300 feet of the LRT alignment:

- Uptown Tires, 79 West 400 South
- Block 40 (Vacant lot), 410 South Carson Street
- The Jacobsen Company, 1919 West North Temple
- EMKO Corp, 1919 West North Temple
- Alamo Rent A Car, 37 North 2400 West
- Thrifty Car Rental, 15 South 2400 West
- Advantage Rent-A-Car, 2375 West North Temple
- Hertz Corporation, 3757 West Terminal Road
- Dollar Rent-A-Car, 3861 Terminal Drive
- KT Inc., dba Budget Rent-A-Car, 3833 New Terminal Drive
- Avis Rent-A-Car, 3781 Terminal Drive
- FAA-Salt Lake City ATBM, SLCIA
- Wheel In Market, 1306 West North Temple
- AHO Apparatus (Old Deseret Paint) 14 South 600 West

- FAA-Salt Lake City ALS-34, South Runway 34, SLCIA
- ANR Freight, 50 South Redwood Road
- Fote's Service, 413 South 300 West
- Lower "B" Concourse, SLCIA
- TU Boiler Plant, TU-1 Generator, SLCIA
- Bus Plaza TU-1 Terminal Drive, SLCIA
- Western Airlines, SLCIA (owned by Delta Airlines)
- United Airlines, SLCIA
- Old FAA Generator-Terminal 1, SLCIA
- East-West Electrical Distribution Engineering, SLCIA
- Delta Airlines, SLCIA
- Skywest Airlines, SLCIA
- Salt Lake City International Airport, 776 North Terminal Drive
- Continental Airlines, 2445 West Jetway Avenue
- National Car Rental, 3801 West Terminal Drive
- David Early Tire, 875 West North Temple
- 7-Eleven #1851-24573, 960 West North Temple
- Chevron USA 72184, 880 West North Temple
- Smith's Gas and Video, 905 West North Temple (out of business)
- Gas Station, 75 South 400 West
- Utah Power and Light Company, 1569 West North Temple
- Rainbo Oil Company #23, 1699 West North Temple
- Cash Saver #17 (Redwood) 1704 West North Temple
- Chris' Chevron Service, 1698 West North Temple
- Circle K #8770 (Old Chevron #78058), 1692 West North Temple

- Natural Resources ISF Motor Pool, 1636 West North Temple
- Old DWR Site, 1596 West North Temple
- Utah Power and Light Company, 1407 West North Temple
- U S West Communications Building, 81 North 400 West
- Top Stop C-10, 1080 East 500 South
- Hill's Service, 404 South 300 West
- Continental Baking Company, 734 East 400 South
- Flying J, 757 West North Temple
- Minit-Lube #1042, 677 East 400 South
- Minit-Lube #1020, 757 West North Temple
- F. C. Stangl Construction, 804 East 400 South
- Rainbo Oil Company # 18, 680 East 400 South
- Jack Jims, 1840 West North Temple
- C Store, 2198 West North Temple
- Wonder Hostess Bakery Thrift Shop, 708 West North Temple
- University 66 (#7092), 873 East 400 South
- Baskin Robbins Ice Cream, 576 East 400 South
- M. Kent Foote, 935 West North Temple
- Utah Power and Light Transportation #2, 1355 West North Temple
- Pacificorp EPUC #2 and #3, 1359 West North Temple
- American International Rent-A-Car, 1380 West North Temple
- Utah Power and Light Gadsby-Jordan Plant, 1359 West North Temple
- Granite Mill Industrial Complex, 1055 West North Temple
- Bob Murray, 1260 West North Temple
- Custom Enterprises, Inc., 1255 West North Temple

- Creed Laboratories, 15 South Jeremy Street (840 West)
- Flexi-Lease, Inc., dba Payless Car Rental, 1974 West North Temple
- Park-N-Jet, 2085 West North Temple
- Jim Young/Hermes Associates Ltd., 502 East 400 South
- 7-Eleven 1851-29514, 309 East 400 South
- U S West Rose Park Central Office, 1550 West North Temple
- Salt Lake Hardware Building, 105 North 400 West
- Salt Lake City Fire Department Station #15, 119 South Wasatch Boulevard
- EIMCO Process Equipment Co., 414 West 300 South
- SDI, 378 West 300 South
- Sinclair, 445 South Main Street
- University of Utah Motor Pool, 425 South 1778 East (South Campus Drive)
- David Early Tires, 378 South West Temple
- Chevron USA-77152 Chris Keith, Inc., 351 South West Temple
- Exchange Place Garage, 30 East Exchange Place
- Downtown Market, 379 South 300 West

### *E. Utah Leaking Underground Storage Tank (LUST) List dated January 1998, Source: Utah Department of Environmental Quality Division of Environmental Response and Remediation.*

The LUST list indicates an inventory of known leaking underground storage tank sites. The list is compiled in response to requirement Subtitle I, Section 9003 (h) of RCRA. A review of the list indicated seventy three locations within 300 feet of the LRT alignment:

- Uptown Tires, 79 West 400 South
- Hertz Corporation, 3757 West Terminal Road
- KT Inc., dba Budget Rent-A-Car, 3833 New Terminal Drive
- United Airlines, SLCIA

- Avis Rent-A-Car, 3781 Terminal Drive
- Skywest Airlines, SLCIA
- Continental Airlines, 2445 West Jetway Avenue
- National Car Rental, 3801 West Terminal Drive
- Midwest Car Corporation, 3801 West Terminal Drive
- David Early Tire, 875 West North Temple
- Chevron USA 72184, 880 West North Temple
- Smith's Gas and Video, 905 West North Temple
- Gas Station, 75 South 400 West
- Utah Power and Light Company, 1569 West North Temple
- Rainbo Oil Company #23, 1699 West North Temple
- Cash Saver #17 (Redwood) 1704 West North Temple
- Chris' Chevron Service, 1698 West North Temple
- Natural Resources ISF Motor Pool, 1636 West North Temple
- Old DWR Site, 1596 West North Temple
- Utah Power and Light Company, 1407 West North Temple
- JAZZ Arena Parking Site, City Block 84
- Hill's Service, 404 South 300 West
- Fote's Service, 413 South 300 West
- Flying J, 757 West North Temple
- Minit-Lube #1042, 677 East 400 South
- Minit-Lube #1020, 757 West North Temple
- Dollar Rent-A-Car, 3861 Terminal Drive
- Jack Jims, 1840 West North Temple
- C Store, 2198 West North Temple

- Baskin Robbins Ice Cream/Hermes Associates, Ltd., 576 East 400 South
- M. Kent Foote, 935 West North Temple
- 7-Eleven 1851-24573, 960 West North Temple
- Q Lube, Inc., 757 West North Temple
- Alamo Rent A Car, 37 North 2400 West
- Goodyear Tire and Rubber Company, 378 South West Temple
- Q Lube, Inc., 677 East 400 South
- Utah Power and Light Transportation #2, 1355 West North Temple
- Granite Mill Industrial Complex, 1055 West North Temple
- Bob Murray, 1260 West North Temple
- Custom Enterprises, Inc., 1255 West North Temple
- Park-N-Jet, 2085 West North Temple
- Utah Power & Light Transportation #2, 1355 West North Temple
- Jim Young/Hermes Associates Ltd., 502 East 400 South
- U S West Rose Park Central Office, 1550 West North Temple
- Salt Lake Hardware Building, 105 North 400 West
- David Early Tires, 378 South West Temple
- Wheel Inn Market, 1370 West North Temple
- Chevron USA-77152 Chris Keith, Inc., 351 South West Temple
- Exchange Place Garage, 30 East Exchange Place
- Downtown Market, 379 South 300 West

***F. Utah Landfill Inventory dated June 1997, Source: Utah Department of Environmental Quality Division of Solid and Hazardous Waste.***

The Utah Landfill inventory lists landfills that are either in operation or have been closed. A review of the list indicated one location within 300 feet of the LRT alignment:

- South Temple Landfill was not located on the list but it borders North Temple from Redwood road to the Jordan River approximately 175 acres in size. and its office was located at 55 South Redwood Road.

***G. EPA National Superfund Priority List (NPL) Sites dated January 1998, Source: United States Environmental Protection Agency Region 8.***

The NPL lists Utah sites that are currently on or deleted from the list and the status of activities for each site at the time the report was prepared. The list is compiled by the EPA and lists highest priority sites according to CERCLA 42 USC 9605 (a) (8) (B) and 40 CFR Part 300. A review of the list indicated one location within 300 feet of the LRT alignment:

- Utah Power and Light/American Barrel Company, 500 West South Temple

***H. Emergency Response Notification System List (ERNS) dated September, 1997 Source: United States Environmental Protection Agency. This provided information from October, 1986 to September, 1997.***

The ERNS list indicates the reported CERCLA hazardous substance releases or spills in amounts greater than reportable quantities, as maintained at the National Response Center. Notification requirements are arranged in 40 CFR Parts 302 and 355. A review of the list 15 leaks or spill locations within 300 feet of the LRT alignment:

- 15 releases were reported from facilities along the LRT alignment. However 12 were reported at various facilities of Utah Power and Light located on West North Temple Street.

***I. Facility Index System (FINDS) Version 5.00/1.10 dated September 1993, Source: United States Environmental Protection Agency.***

The Facility Index System contains facility information and background information that might list or cross-check information from other sources to get a better understanding of the site. The following lists are used by this system:

- Aerometric Information Retrieval System (AIRS);
- Federal Insecticide, Fungicide, Rodenticide Act (FIFRA);
- Toxic Substances Control Act (TSCA);

- FIFRA/TSCA Tracking System (FTTS);
- RCRIS;
- CERCLIS;
- Permit Compliance System (PCS);
- Enforcement Docket used to manage and track information on civil, judicial, and enforcement cases for all environmental statutes (DOCKET);
- Federal Underground Injection Control (FURS);
- Federal Reporting Data System (FRDS);
- Surface Impoundments (SIA);
- TSCA Chemicals in Commerce Information System (CICIS);
- PCB Activity Database System (PADS);
- Medical waste transporters/disposal (RCRA-J); and
- Toxic Chemical Release Inventory System (TRIS).

M Many different listings were indicated on this list for sites along the LRT alignment, and they will ll be listed in Appendix C

### 3.2 2 PHYSICAL SETTING SOURCES

Fort Douglas Quadrangle, Salt Lake County, Utah 7.5 Minute Series (Topographic), 1975, Department of the Interior United States Geological Survey, Reston, Virginia.

Salt Lake City North Quadrangle Salt Lake County, Utah, 7.5 Minute Series (Topographic), 1975, Department of the Interior United States Geological Survey, Reston, Virginia.

### 3.3 3 HISTORICAL USE INFORMATION

The historical uses of the properties will be listed in tabular form and will be included in Appopendix D. This information was obtained from Polk's City Directory's of Salt Lake City. The te earliest year available is 1925. This correlates well with deed information and Sanborn Fire Insusurance Maps of the same period.

**I Diamond Airport Parking 50 South Redwood Road**

- This company is located south of the railroad tracks and across from ABF trucking. The groundwater flow direction at this site is approximately northwest towards the Great Salt Lake. According to documents present at the State of Utah DEQ DERR, the site has extensive oil contamination below the surface. There is also evidece of solvent contamintion at this site. Prior to this site becoming a parking area it was used by a trucking company. The trucking company operated a garage, and refueling for trucks.

**American Barrel Company/Utah Power and Light, 600 West North Temple Street***

- This facility was a coal gasification plant between 1873 to 1920, then it was used for creosote dipping of poles from 1920 to 1945, and it has since been used for many different industrial applications, including drum storage and recycling.
- Groundwater contamination at this site is more extensive than was originally anticipated, chlorinated solvents related to this site have been discovered at a site near 200 South 600 West. Currently, all contamination has been located south of North Temple. However, since samples have been collected only in the known part of operations on this property, to the best of our knowledge, the extent near North Temple Street is not known.
- The Boyer Company, who is overseeing the due diligence for the redevelopment of approximately fifty acres in this area, may have additional information concerning the presence of subsurface soil and/or groundwater conditions in this area. However, to the best of our knowledge this information is not readily available.
- Groundwater flow direction in this area is west to northwest, and the groundwater is located 4.4 to 8.35 bgs (in drier years).
- Groundwater contamination from the UP&L/American Barrel site has been detected beneath the Deseret Paint Company and may have spread to other locations.
- Additional data review are needed to determine the extent of groundwater contamination.
- Since the proposed LRT route will include the installation of an elevated structure along the south edge of North Temple Street additional information will be required.

**Deseret Paint, 14 South 600 West:**

- This facility was owned by W. P. Fuller Oil Company, who purchased the land in 1921 from several land owners.
- It was sold to Bernard and Lillian Secor in 1955, and it became Deseret Paint Company.
- In 1980 they transferred it to Janet Vincent and Stanley Secor.
- In 1987 it was deeded to Janet Vincent 1/3 interest and James Aho 2/3 interest.
- The Deseret Paint building is located approximately 500 feet south of North Temple. Groundwater is contaminated beneath the site by Utah Power and Light/American Barrel past activities.
- The groundwater flow direction at this location is believed to be west towards the Jordan River.
- Depth to groundwater at the American Barrel site is 4.4 feet to 8.35 feet below the ground surface.
- Certain documents were not available during our regulatory review, and more recent documents will need to be reviewed in order to determine accurate groundwater flow directions, and current known extent of the groundwater contaminant plume.

**Q-Lube/Flying J, 757 West North Temple:**

- Groundwater at this location is flowing parallel to North Temple.
- Analytical results from the monitoring wells located adjacent to North Temple do not indicate contamination greater than detection levels in the groundwater.

**David Early Tires Store #5, 875 West North Temple**

- The site is located due south east of the intersection of 900 West and North Temple Street. It is located east of the Smith's Gas and Video Store. Smith's gas has two commingling plumes and David Early Tires is being blamed for one of them.
- The groundwater underneath the Smith's site flows in a northwesterly direction, we assume that this goes for the David Early site as well, although there was no additional information concerning that at the State of Utah DEQ DERR GRAMA review.
- 33.8 mg/L of benzene is present in the groundwater underneath the site. However, a source does not exist for this information. If it is present in the street, vapors may also be present in the proposed LRT Alignment.

**Chevron USA 72184 Ronald Kinyon Chevron, 880 West North Temple:**

- According to information dated June 26, 1996 (Delta Environmental Consultants, Inc.) this is a former Chevron Station.
- Groundwater flow direction at this location is south.
- Analytical results from groundwater samples collected on 20 March 1996 indicate 3.0 microgram per liter (µg/l) of benzene in the groundwater.
- Groundwater ranges in depth from 8.64 feet to 10 feet bgs.

**Smith's Gas and Video 905 West North Temple*** located on the southwest corner of 900 West North Temple.

- Groundwater was encountered at a depth of 8-10 feet bgs, in 1996 and February 1997.
- Significant amounts of benzene (14-57 mg/kg) were detected in the soil and groundwater on the property.
- groundwater flow direction is indicated to be towards the north on the south side of North Temple Street and towards the south on the north side of the street. This pattern is probably due to the location of the City Creek Viaduct located near the center of the street
- MW-14 is located on the north edge of the right-of-way located adjacent to North Temple. The concentration of benzene in the groundwater was measured at 11 mg/kg on 8/21/95.
- Dale Urban of the DEQ/DERR wrote a letter to Mark Reberg (Salt Lake County Zoning) on 29 April 1997 warning anyone digging to a depth greater than 5 feet may encounter hazardous conditions. These conditions may include encountering hazardous vapors, hazardous soil, and hazardous groundwater. When working in this area proper PPE should be worn by workers.

**Culeasing and Sales /Low Cost Car Rentals, 935 West North Temple**

- groundwater was encountered at a depth between 8.5 to 9 feet bgs.
- groundwater flow direction is to a westerly direction. Does this mean northwesterly?

**7-Eleven Store #24573-1851, 960 West North Temple**

- The information obtained from the State of Utah DEQ DERR indicated that only the UST list information was available for this site. However this site is listed under the LUST listing so a file for that must be available somewhere as well. We will contact them again for that information.
- They had a spill of 81-83 gallons of product onto the ground surface on 12 February 1989 at 11:05 PM, the cleanup contractor did not arrive on-site until after 9:30 AM , Monday 13 February. The site was not cleaned up until 3:00 PM that afternoon.
- The groundwater flow direction at this site should be south towards the street, and the depth to groundwater should be approximately 8-10 feet bgs.

**Granite Mill Industrial Complex, 1055 West North Temple***

- This site is located on the south side of West North Temple, due to the site drawing the exact location of the contamination cannot be determined.
- A closure report prepared by Wasatch Geotechnical, Inc., on 12 December 1990 indicates significant contamination of 27,000,000 ug/kg TPH, and 41,000 ug/kg benzene in the subsurface at a depth of 8 feet. It does not indicate the depth to groundwater or the groundwater flow direction. However, in a facility located east of this site the groundwater flow direction is towards the north, and the depth to groundwater ranges from 8-10 feet.
- The site was previously owned by the Salt Lake, Garfield, and Western railroad Company/Salt Lake and Los Angeles Railroad Company (1903-1962) and McGraw-Edison Company (1962-1978).
- A site visit will be required in order to determine the distance from the excavation site to North Temple.

**Bob Murray, 1260 West North Temple**

- According to the TPH Rocky Mountain Report, dated 1 April 1997, the contamination at this site is reportedly isolated approximately 300 feet north of North Temple.
- groundwater flow direction, and depth to groundwater was not determined in this report.
- The closest site is located at 1306 West North Temple
- The groundwater flow direction at that facility is to the northeast away from North Temple.
- Depth to groundwater at that location is approximately 6 to 8 feet bgs.

**Wheel Inn Market 1306 West North Temple,** located on the north side of the road.

- The groundwater flow direction at this facility is to the northeast away from North Temple.
- Depth to groundwater at this location is approximately 6 to 8 feet bgs, according to Earl Underwood, who is completing a cleanup of that site. He also mentioned during a conversation on 6-23-98 that any contamination would be located north of the sidewalk on the north side of North Temple. Approximately 1000 tons of soil were excavated, and 10,000 gallons of water removed during the recent removal action.

**Pacificorp 1407 West North Temple**:

- Groundwater was encountered at approximately 4-7.5 feet bgs.
- A leaking underground storage tank on the site caused degradation of the groundwater surrounding the tank pit.
- This area is located several hundred feet south of North Temple Street.

- Groundwater flow direction is towards the northwest, and the plume is preferentially following a sewer conduit, towards North Temple, according to State of Utah DEQ DERR records.

**U.S. West Business Resources, Inc. 1550 West North Temple**

- Depth to groundwater ranges from **7-11 feet bgs** (1993 information)
- Groundwater flows "consistently to the southwest" Delta, 1994
- Subsurface contamination has been detected in two wells located north of North Temple.

**Chris's Chevron, former Chevron Station, 1698 West North Temple**

- Groundwater has been measured at 8-11 feet bgs, and flows consistently in a southwest direction.
- It appears that groundwater flow direction changes due to the amount of rainfall and infiltration occurring in the surrounding areas.
- According to information obtained from the State of Utah DEQ DERR, underground storage tanks at the Chevron Station on the north west corner of West North Temple and Redwood Road have leaked and caused contamination of the subsurface.
- Extraction wells are present on the southern edge in the Chevron property.
- The groundwater flow direction at this site has been interpreted to flow both in the northeast direction and in the southeast direction, however, it is not known if either direction is correct, or if it fluctuates due to amount of precipitation.
- There are also two other gas stations at this intersection that may have contributed subsurface contamination. The Rainbo Station located on the southeast corner of the intersection has an air sparging and water extraction system on the west and north property boundaries.

**Rainbo Station #23 (Amoco) 1699 West North Temple**

- Groundwater flow direction according to a 1992 report by Applied Environmental is towards the northwest, in a later report by Delta, they indicate that the groundwater flow is directly north.
- Depth to groundwater is 10 to 11 feet bgs.
- A setup of 7 sparging wells and 12 extraction wells are located on the site. According to a 3rd Quarter monitoring report by Delta, no contamination exceeding Utah's RBCA Level 1 was detected in any well on-site.

**Premium Oil/Cash Saver/Chevron 1704 West North Temple**

- Site is located on the North West corner of the intersection of Redwood Road and North Temple.
- The groundwater flow direction at this site has been interpreted to flow towards the center of the intersection (southeast).
- depth to groundwater is approximately 8.5 feet below ground surface. However, in two monitoring wells on the south portion of the property up to 2.75 feet of product was detected.
- More information on this site is needed prior to making any conclusions.

**Pacificorp dba Utah Power and Light 41 North Redwood Road**

- This site had a waste oil tank located on the north side of its maintenance shed. The tank contained waste oil and F listed solvents.

- Groundwater was believed to be 8-10 feet bgs. and was not encountered during the tank removal and subsequent soil removal phases of the project.
- All contaminated soil surrounding the tank was removed but no monitoring of groundwater was completed.

**South Temple Landfill, 55 South Redwood Road***

- The location of this facility was recently discovered by the State of Utah Department of Environmental Quality Division of Response and Remediation (DEQ DERR) March, 1997.
- Currently little information is available but it was in operation from 1895-1930's (prior to the time when Utah Power and Light purchased land for the current Gadsby power production facility).
- The actual time frame for the land purchase is not entirely known, but the following time frame has been postulated in DEQ DERR documents, was 1903 to 1943.
- The landfill was owned and operated by Utah Light and Traction, later Utah Power and Light.
- Many manufacturing facilities were in operation in the area during that time period.
- Groundwater flow direction is northwest across (beneath) North Temple.
- Groundwater depths are approximately three to seven feet below ground surface.
- Additional information was obtained from the Environmental Health Administration Bureau of Water Quality and Hazardous Waste. They indicated that the area under the parking lot at 1500 West North Temple was previously a landfill.
- Information obtained from documents prepared by JBR consulting indicate the presence of crushed glass, iron staining and petroleum hydrocarbons in the subsurface at this location.

**Jack and Jims Service, 1848 West North Temple.**

- 4 tanks were removed in December 1989 three contained gasoline and one contained diesel.
- All BTEX samples were less than detection limit and highest TPH concentration was 39.94 ppm.
- contaminated soils surrounding the tank were overexcavated and aerated for 3 years.
- groundwater was not encountered in any excavation. However it should be located 8-10 feet bgs.
- Groundwater flow direction should be towards the southwest at this location.

**Ault's C Store, 2198 West North Temple***

- Information provided in an August 2, 1993 Westech Fuel Equipment report indicates an equipment failure and subsequent release at this site. A worn filler pipe coupling on one of the tanks was the culprit.
- Groundwater flow direction is normally to the southwest, but during years of high infiltration the groundwater flow direction is towards the southeast.
- Groundwater elevations in creased up to two feet in elevation from the measurements taken in 1992 to those in 1993, and ranged from 3.89 to 5.67 feet bgs.
- benzene was detected in the groundwater at concentrations between 18 to 30 ug/L.
- It is difficult to say what may be located beneath North Temple, but due to the depth to groundwater, it may be in our best interests to complete several sampling locations at the intended location of the LRT.
- The station no longer exists and the site which has become a parking lot.

**Park and Jet, 2200 West North Temple**

- According to information presented in a July 1994 report by J.P. Redd, Inc. the groundwater flow direction is towards the northwest, but they don't indicate the depth to groundwater.
- However, they mention that the highest groundwater contamination is in the 6-8 foot interval of the groundwater.
- This facility is located south of West North Temple and several hundred feet from the proposed LRT alignment to the north.

**Litton Systems 2211 West North Temple Street***

- This facility has been used as a manufacturing facility for guidance systems.
- According to the TRIS database they use a considerable amount of solvents.
- It has been noted in regulatory documents that TCE and Freon 113 have migrated to monitoring wells located on the north edge of the property.
- The groundwater flow direction at this facility is northwest underneath North Temple and the depth to groundwater ranges from 1.72 to 5 feet below ground surface (in drier years).
- The concentrations of Freon 113, 1,1,1-Trichloroethane, (1,1,1-TCA), and degradation products have been decreasing as the plume moves toward North Temple.
- Due to the depth to groundwater at this site a Phase II sampling program in the area of the LRT Alignment should be considered prior to progressing.

**Alamo Rent-A-Car Inc., 37 North 2400 West**

- Has been taken of the LUST List by the state of Utah September 15, 1992. However, no subsurface investigation has been completed surrounding the site to determine the presence or absence of contamination.
- this site is far from the alignment, and the groundwater flow direction is towards the northwest and away from the proposed alignment.

**Avis Car Rental, former Hertz Car Rental 3775 Terminal Drive***

- According to recent documents dated 1997, this facility has free product in the form of JP-8 or "Jet-A" on the southern portion of the property in two monitoring wells. Gasoline is found in several monitoring wells including those in the northernmost portion of the site.
- The source of one free product plume is the former Western Airlines Bulk Terminal which was located 200 feet east of the current Avis location.
- The source of the other plume is a UST leak at the former Hertz Car Rental, according to Groundwater Technology reports for the subject site.
- The currently proposed location of the LRT alignment, to the best of our knowledge will be through this site and may be located in the Hertz plume.
- Groundwater flow direction is towards the northeast according to State of Utah DEQ DERR reports.
- The Groundwater technology report indicates that the two plumes are comingled and that the gasoline is from an unknown source.

- The depth to groundwater ranges from 5 to 7 feet, but may be higher this year due to the increased precipitation.
- After reviewing both the Hertz documentation and that pertaining to the Western Airlines Bulk Fuel Terminal, it appears that the Hertz plume will be closer to the LRT Alignment

**National Car Rental 3801 West Terminal Drive*** this site is located approximately 100 yds. south of the short term parking structure.

- Groundwater typically ranges from 4-10 feet beneath the site. When groundwater measurements were taken in June 1992, the depth to groundwater ranged from 5-7 feet bgs.
- groundwater flow direction appears to be towards the north.
- concentrations of benzene on the site ranged from .025 ug/l to 28,000 ug/l.

**Former Gas Station, 75 South 400 West** (under Delta Center parking lot)

- The groundwater was located at 14-19 feet bgs, and flow direction at this site was west to southwest. However, due to the installation of a permanent dewatering system under the Delta Center, groundwater is located below 30 feet bgs, and groundwater flow is presumably from offsite into the Delta Center dewatering wells.
- Since the groundwater has been lowered to a depth of at least 30 feet bgs and most of the soil contamination was excavated and disposed offsite.

**Uptown Tire Inc., 79 West 400 South** This site is located on the south east corner of the intersection of West Temple and 400 South.

- According to information from PSI, the tanks were removed on November 27, 1996.
- One tank was located within ten feet of the sidewalk along the southern boundary of 400 South
- Another tank was located underneath the sidewalk on the southern edge of 400 south, and has been closed in place. However, the contamination surrounding the tank was not removed.
- No contamination greater than RBCA Tier I was encountered.
- groundwater is believed to be 10-12 feet bgs, and the flow direction is believed to be towards the northwest, into 400 South.
- According to the report a fiber optic cable was installed on top of the tank, and the impacted soils are 10 feet bgs.

**Hill's Service, 404 South 300 West**

- As of 15 May 1995, the DEQ DERR submitted a letter to Mr. Hill indicating that "significant, but limited, petroleum contamination remains in-place at the facility, but at depths that are not considered a threat to human health or the environment at this time due to current land use, exposure pathways, receptors and other risk characteristics."
- Groundwater flow direction from this site is towards the southwest, away from 400 South
- A Phillips 66 Station is located on the northeast side of the street, and contamination was detected in a monitoring well located south west of the dispenser islands in the street
- depth to groundwater was measured at 8-11 feet bgs.

**Hermes Associates Ltd. property located between 500-600 East and 400-500 South:**

- A former Texaco Service Station was located on this property, owned by Jim Young.

- Hermes currently owns the property located beneath a Fred Meyer Super Store and a Blockbuster Video.
- According to documents obtained from the State of Utah DEQ DERR contamination was not detected in a boring located near 400 South Street.
- The apparent groundwater gradient at this site is towards the southwest.
- Depth to groundwater is 10 feet.

**Mt. Olivet Cemetery Plume 666 South Guardsman Way:**

- This is a Tetrachloroethene (PCE) and other solvent plume, located south of the University of Utah property and extending northwest approximately 2000+ feet.
- The depth to the first confined interval in the University of Utah Well No 2 is 175 feet bgs.
- The contamination has been detected in University of Utah Well No 2.
- The plume is located south of the proposed LRT alignment.

### 3.3.1 TITLE SEARCH

A search of the ownership of the land was initiated but we were informed by the city recorder that it would take a considerable amount of time (several weeks) to determine all the transactions that took place in order to purchase the land along the LRT alignment. The records were searched by Parsons ES and the following information was collected.

The land for the Deseret Paint was purchased by W. P. Fuller & Company from a number of private citizens in 1921.

- July 28, 1921 Sarah & Alexander Brown to W. P. Fuller & Company,
- July 27, 1921 Utah Savings and Trust to W. P. Fuller & Company,
- November 9, 1921 William B. and Hannah M. Davis to W. P. Fuller & Company,
- January 12, 1955 W. P. Fuller & Company to Bernard H. and Lillian Secor,
- December 20, 1971 Bernard H. and Lillian Secor to Janet Vincent & Stanley Secor,
- January 6, 1972 Bernard H. and Lillian Secor to Janet Vincent & Stanley Secor,
- October 31, 1980 Stanley B. Secor to Deseret Paint Company,
- November 28, 1980 Janet S. Vincent Trustees to Janet S. Vincent & Trustees,
- Currently owned by James Aho 2/3 interest and Janet S. Vincent 1/3 interest.

### 3.3.2 AERIAL PHOTOGRAPHS

Historical use was also documented by aerial photographs from Olympus Aerial Surveys Inc. An extensive collection of low altitude historical aerial photographs were available of the parcels adjacent to the LRT alignment. Photocopies of these photographs are available in Appendix B

## SECTION 4.0
## INFORMATION FROM LRT ALIGNMENT RECONNAISSANCE AND INTERVIEWS

### 4.1 HAZARDOUS SUBSTANCES IN CONNECTION WITH IDENTIFIED USES

Site walks were completed in several areas to determine the presence of surface staining and the presence of any unknown containers. The first location we visited was the Smith's Gas and Video site. This location was closed and was surrounded by a 5 foot high chainlink fence with an open gate. There were several stains on the surface and monitoring wells were visible on the property and in the right-of-way near the intersection of 900 West and North Temple Street. A gravelly sand area was visble on the surface indicatiing the location of the former tank pit. Another source of potential surface contamination, according to the Environmental Health Administration Bureau of Water Quality and Hazardous Waste, is fallout from the former Remington Arms Plant. The plant was located at approximately 1500 South and Redwood Road. The general area of fallout is North Temple to 2100 South and Redwood road to 7200 West. The fallout consists of metals used during the manufacturing of ordnance.

### 4.2 HAZARDOUS SUBSTANCE CONTAINERS AND UNIDENTIFIED SUBSTANCES

During our site visits there was no indication of unidentified containers outside of any building visited. Surface staining was apparent at several locations. A facility was located on 2400 West, west of the Enterprise Car Rental, and north of Precision Air Power which is located at 20 North 2400 West, and had an old fuel dispenser. We did not enter the property to check the dispenser, because we did not have permission from the owner/operator. The adjacent groundwater flow direction at the Litton Guidance Facility is northwest, and the groundwater flow should be similar and should not intersect the LRT Alignment.

### 4.3 INDICATIONS OF PCBS

To date the only information available concerning PCB spills has been obtained through the ERNS database and the review of regulatory documents. This information indicates that numerous PCB spills have occurred at the Utah Power and Light property at 1407 West North Temple. However most reported spills have been reportedly cleaned up within a few days. Most spills have been located several hundred feet from North Temple Street.

### 4.4 INDICATIONS OF SOLID WASTE DISPOSAL

Currently the only indications of solid waste disposal is the South Temple Landfill property located adjacent to North Temple Street. It was bounded on the south by Interstate 80, on the east by the Jordan River, and on the west by Redwood Road encompassing approximately

175 acres. According to information obtained from the State of Utah DEQ DERR several soil borings were completed in the proposed landfill area. The borings contained evidence of disposal, including glass fragments, iron staining, various metals, petroleum hydrocarbons, and two semi-volatile organic compounds. Additional information obtained from the Environmental Health Administration Bureau of Water Quality and Hazardous Waste, indicated that the area under the parking lot at 1500 West North Temple was previously a landfill (personal conversation, 1998). This is in the same vicinity of the identified landfill.

## SECTION 5.0

## CONCLUSIONS

As of 29 June 1998, we recommend that a Phase II investigation be completed on seven sites. These sites are Litton Systems 2211 West North Temple Street, Ault's C Store, 2198 West North Temple, South Temple Landfill which borders West North Temple from Redwood Road to the Jordan River. Utah Power & Light/American Barrel Superfund Site which borders the south side of 600 West North Temple, and the roadway through the airport load/unload areas which will be the temporary location of the LRT Alignment, and Smith's Gas and Video 905 West North Temple, Deseret Paint, 14 South 600 West, During our evaluation of the Deseret Company site, data indicated that groundwater contamination related to the Utah Power & Light/American Barrel Superfund Site had been encountered beneath the site. It is possible that contamination may exist further north and west of this location. We have been informed that solvent contamination from the American Barrel site has been found as far as 200 South 600 West.

The City Creek viaduct is located down the middle of North Temple Street and carries water from City Creek. This viaduct was originally installed to divert the water away from the building location for the Salt Lake City Temple. It was installed in a wood culvert, that was replaced with concrete in the 1920's. This viaduct begins at the mouth of City Creek canyon (North Temple and First East Street) and ends at the Jordan River. The exact dimensions are unknown at this time, but it is open underneath the bridge on the east side of North Temple at 400 West. It evidently has a significant effect on groundwater as can be seen from the groundwater flow maps for Smith' Gas and Video and David Early Tires #5, located at the intersection of 900 West and North Temple Street drawn by Wasatch Geotechnical.

## SECTION 6.0

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Utah Registered Underground Storage Tank (UST) List dated January , 1998, Source: Utah Department of Environmental Quality Division of Environmental Response and Remediation.

Utah Leaking Underground Storage Tank (LUST) List dated January , 1998, Source: Utah Department of Environmental Quality Division of Environmental Response and Remediation.

Utah Landfill Inventory dated January , 1998, Source: Utah Department of Environmental Quality Division of Solid and Hazardous Waste.

VISTA Innovative Solutions, 1998, West-East Alignment for Light Rail Project

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# PUBLIC INVOLVEMENT PLAN

# WEST/EAST TRANSPORTATION CORRIDOR STUDY
# FINAL ENVIRONMENTAL IMPACT STATEMENT

**Prepared By**

**PARSONS TRANSPORTATION GROUP**

**February 1998**

**Public Involvement Plan**
**West/East Transportation Corridor Study**
**Final Environmental Impact Statement**

## I. Introduction

Public and stakeholder involvement is an important component of the decision-making process for the West/East Transportation Corridor in Salt Lake City. This is especially true as the project moves forward to the preparation of the Final Environmental Impact Statement (FEIS) and Record of Decision (ROD). As a result of comments received on the Major Investment Study / Draft Environmental Impact Statement (MIS/DEIS) and input received during agency coordination, issues and questions have been raised that need to be addressed by the project study team. Each public participant, each agency has unique interests and perspectives as to what the transportation solution for the West/East Corridor Study should be. Therefore, input from residents, public and private interests and regulatory agencies will continue to be sought throughout the FEIS process. This public involvement plan is designed to continue the information exchange and communication links that were formed during the MIS/DEIS phase. Moreover, it is designed to create new opportunities for discussion and dialogue with project decision makers about planning and design issues specific to the locally-preferred alternative (LPA), a light rail transit (LRT) system.

### A. Purpose of Plan

The purpose of the plan is threefold:

1. To effectively respond to MIS/DEIS comments received from the public and agencies and address issues resulting from those comments by way of additional study or evaluation;

2. To continue the public involvement process established during the MIS/DEIS phase so project information can continue to be exchanged and interaction with the public can occur;

3. To create focused discussions and dialogue via working groups on specific planning and design-related issues that need to be resolved, as well as on important community needs and interests.

### B. Plan Goals for FEIS Process

The goals for the public involvement program in the MIS/FEIS phase is: (1) to inform residents, business and community interests, public entities, private institutions, regulatory agencies, and other stakeholders of the progress of the West/East Transportation Corridor Study; (2) to provide a forum for input from these diverse groups; and (3) to achieve dialogue with participants on salient issues that will help enhance and shape project decision-making.

## II. Plan Background

### A. Public Involvement During MIS/DEIS Process

A formal **scoping meeting** was held on May 9, 1996. The purpose of that meeting was to solicit input from individuals, neighborhoods, organizations and agencies regarding issues and concerns that should be addressed during the MIS/DEIS study. The meeting was held prior to defining conceptual alternatives for the West/East Transportation Corridor so that issues obtained from the meeting could be used to formulate alternatives and establish appropriate evaluation criteria. Transportation alternatives, traffic congestion, cost, neighborhood and environmental concerns were general areas of interest to participants. Scoping comments helped determine the important issues early in the process, ensuring that all public concerns are known and addressed during the study.

An **information exchange** was established early in the project so the public could be kept well informed during the MIS/DEIS process (see Figure 1). The information exchange included a public informational meeting, community coordination meetings and presentations, responses to questions and informational requests, and updating the public on project status, schedules, conceptual alternatives and preliminary results of studies. A world wide web site was also created and updated regularly to allow the public access to current project information. Visitors to the web site were invited to leave their comments about the project. A project telephone hotline was also installed offering the latest information about the study process and any upcoming events. Callers could leave formal comments or a telephone number where they could be reached if they required further information. Project information was provided regularly to local newspapers via meetings or one-to-one discussions with reporters.

Prior to determining alignment options and detailed alternatives, an informal open house and public meeting was held in September 1996. A project newsletter was sent to everyone on the mailing list prior to the open house to update residents. The newsletter also notified the public of the open house and informational meeting and invited their participation. Copies of the newsletter were also sent to residents not on the mailing list to ensure fuller public participation. Discussions regarding alternatives, proposed alignments and associated technologies of the proposed LRT system occurred. Public comments were gathered and used in screening the wide range of conceptual alternatives down to detailed DEIS alternatives.

The West/East Transportation Corridor **Steering Committee** provides the central focus of technical oversight for the study process (see Figure 2). The Steering Committee is comprised of representatives of the Wasatch Front Regional Council, Salt Lake City, Salt Lake City Redevelopment Agency, Salt Lake City Airport Authority, Utah Transit Authority, Utah Department of Transportation, University of Utah, Federal Transit Administration, Federal Aviation Administration and the Federal Highway Administration. Through regular review meetings, the steering committee members have commented on the screening and selection of conceptual alternatives, alignment options and the detailed EIS alternatives. They have directed the project team in conducting the study, review the comments of citizen committees, and members have interfaced with state and local officials and regulatory agencies (see Figure 2).

Two **Citizens Advisory Committees** were formed in the west and east portions of the study corridor. Beginning in June 1996, the committees met three times during each evaluation phase of the MIS/DEIS study process. The meetings were facilitated to provide project information to committee members and to gather community input regarding alternatives to be evaluated, alignment options and important project issues. After detailed alternatives were determined, the West and East Citizen Advisory Committees met in February 1997 with the study team to receive the results of the alternatives analysis to provide additional input on the alternatives, prior to the agency review process. Issues focused on Transportation Systems Management (TSM) and the Transportation Demand Management (TDM) strategies, bus and High Occupancy Vehicle (HOV) options, and rail transit, associated technologies and potential alignments.

Further public input was gathered from **downtown stakeholders** (see Figure 2). Individual meetings were held with interested parties to discuss alternatives and general project issues. These meetings included the city council, planning commission, transportation fairs and community council meetings. No formal committee was formed during the MIS/DEIS process, yet all downtown stakeholders that expressed an interest in the project were contacted. Moreover, the Downtown Alliance, an organization of downtown businesses and property owners, was also kept informed through a series of presentations which provided information about alternatives and alignment options. Individuals business interests, as well as the Downtown Alliance, who had comments were considered in the study process. Information on the goals and objectives of downtown was also obtained from groups such as the Salt Lake City Futures Committtee.

**Resource and regulatory agency contacts** began early in the study process. Agency input was requested during scoping and input was solicited throughout the data collection and technical analysis for the MIS/DEIS. All appropriate federal, state and local agencies were consulted regarding general and project specific information on a variety of issues ranging from historic and cultural resources to wetlands and water quality. In some cases, such as the U.S. Army Corps of Engineers, field visits were conducted to discuss specific environmental issues and potential impacts. Members of the study team coordinated and met with agency representatives when necessary to ensure a clear understanding of all issues and potential concerns.

### B. Results of MIS/DEIS Public Involvement Program

The MIS/DEIS public involvement plan has resulted in the effective communication of project information and informed discussions between citizens , interest groups and project planners. It has achieved the active participation of residents, stakeholders and other interested parties in the West/East Corridor decision making process. Input received during public meetings, community presentations and the citizen advisory committees was seriously considered during the screening of alternatives and EIS alternatives analysis phases. Comments received through the information exchange were also important to the development of the study process.

Another important milestone in the National Environmental Protection Agency (NEPA) and public involvement process was the public distribution and 45-day comment review period for the MIS/DEIS. Copies of the MIS/DEIS were made available to the public and regulatory agencies on August 1, 1997 via city and university libraries and through specific EIS document mailings or notifications of availability. In addition, an open house and public hearing was held on August 18, 1997 to inform residents about the project, the locally preferred alternative, a LRT system, and to give them an opportunity to comment on the study results disclosed in the DEIS. Ample time was given at the open house and public hearing for the public to acquire project information, view exhibits, express their concerns or ask questions. These comments were an important source of information about the residents, city officials, and other stakeholders views of the proposed project.

## C. Project Issues Identified

As a result of the information exchange, the study team and the Steering Committee efforts, and the public hearing, a number of issues and concerns were identified. Issues focus on aspects of the locally preferred alternative, a LRT system, alignments especially through downtown, aesthetics, station locations, LRT design, cost, schedule for construction, operation schedules, interface with other transportation modes(light rail, bus, bicycles), potential traffic conflict (vehicular left turns), ridership (day of opening and future year operation), an LRT extension to the Research Park , among other issues. For a more detailed record of the project issues raised during the MIS/DEIS public involvement program see Appendix A of the MIS/DEIS - Public Involvement Report; and the Documentation of Unresolved Issues technical memorandum.

## III. FEIS Public Involvement Plan

The FEIS public involvement plan will build upon the success of the MIS/DEIS plan which garnered public and agency input into discussion of technologies, strategies and modes; the screening and evaluation of alternatives; and the environmental assessment of EIS alternatives. The intent of the FEIS plan is to create an open and highly visible decision making process that values and seeks public and stakeholder participation and ensures that the spectrum of public interests and concerns are fairly represented. Moreover, the goal is to ensure issues that have been identified are resolved openly and creatively.

### A. Responses to DEIS Comments

An important part of the FEIS process is responding to oral and written comments received on the MIS/DEIS. The NEPA Council on Environmental Quality (CEQ) regulations require that all comments and concerns raised during the DEIS phase be adequately addressed in the FEIS. The first step in responding to comments is fully documenting the comments received during the public hearing. A public hearing comment log has been created documenting the commentator, type and nature of the comment and any unresolved issues that need to be studied in the FEIS phase. A complete public involvement volume will be prepared and included as an appendix of the FEIS. In addition, other issues or concerns that have been raised through meetings and correspondence after the formal 45-day comment period will be documented and addressed as part of the plan. A technical memorandum documenting all unresolved issues will also be prepared.

Responses to DEIS comments will be prepared and included as a separate section of the FEIS. In some cases, to fully respond to the comments or answer the questions raised, additional technical analysis will be necessary. For example, based upon MIS/DEIS input, the study team is now evaluating several downtown alignment options in order to find the optimal location for the LRT system. Based upon the wetlands and water quality investigations that were completed for the DEIS, wetlands delineations and a water quality analysis will be done during the FEIS phase. The DEIS also identified the need for a Phase 1 Site assessment (for potential contaminated sites). This site assessment will need to be accomplished for certain portions of the corridor. Due to public comments, and input from public officials and other interests, several LRT extensions and alignment options will be investigated as part of the additional FEIS technical analysis. The LRT extensions include a potential extension to the International Center in the western portion of the corridor and an extension through the Research Park to the Hogle Zoo on the east end of the corridor. Alignment options through downtown Salt Lake City include Rio Grande Street and 300 South. Other planning and environmental technical studies, such as historic and cultural resources coordination, will be conducted as a more detailed LRT alignment is developed and assessed.

## B. Plan Continuation

In order to continue active public participation in the planning and engineering studies for the West/East Transportation Corridor, the two major focuses of the DEIS public involvement plan, the Information Exchange and Steering Committee, will continue throughout the FEIS phase (see Figures 2 and 3). The information exchange provides the foundation of the public involvement process. The goals of the information exchange continue to be:

- To provide diverse groups with equal access to information and project planners and engineers;
- To communicate public concerns and possible solutions to the study team and Steering Committee members; and
- To reach informed consent on the optimal design and alignment location of the locally preferred alternative, a LRT system.

Replies to correspondences, informational requests, the telephone hotline, and world wide web site will continue as part of the FEIS Information Exchange (see Figure 3). Community presentations and stakeholder meetings, such as local officials, civic, neighborhood organizations, will also occur as requested. To keep the public updated on the FEIS process, several newsletters will be published and distributed to the established project mailing list. Names of interested persons will continue to be added to the mailing list throughout the FEIS phase. The newsletters will include, but not be limited to, information on major issues regarding LRT project development and how those issues are being resolved. It will also include updates on the project status, schedule, and results of studies. Moreover, it will include contact names and phone numbers for project planners as appropriate, notices of upcoming meetings, and other ways the public can actively participate in the FEIS process. Residents, public officials, community leaders and agency representatives will have ample time to ask questions and comment on issues as part of the Information Exchange.

As already mentioned the Steering Committee, the second major focus of the FEIS public involvement plan, will continue to lead the West/East Transportation Corridor Study and the FEIS decision making process. Regular monthly meetings on important project issues will continue to occur until the FEIS Record of Decision and the end of the study (see Figure 2). The meetings provide a forum for key agency representatives to discuss project issues and LRT planning and design elements.

## C. Stakeholder Involvement

The FEIS public involvement plan for the West/East Corridor Study is designed to be a solid, comprehensive public focused program. It contains the basic components of successful public involvement programs and meets the intent and requirements of NEPA with regard to informing the public and providing opportunities to comment on the proposed project. The dissemination of information and number of coordination meetings will be extensive during the FEIS. For the plan to be effective, the study team is thinking beyond traditional public involvement into the context of stakeholder involvement. For more traditional public involvement approaches, many residents and public interests are unorganized and do not engage in public participation modes of decision making. Therefore, sometimes the input received during public informational meetings may not be representative. Moreover, since the focus is primarily on external public involvement, major stakeholders in the planning process, both public and private, go unacknowledged. As a result, competing interests sometimes seek not to shape but to block decision-making efforts to fit their objectives. The traditional approach is not the approach the study team plans to implement for the FEIS. For the FEIS public involvement plan, project planners will help residents and interest groups get organized, at a grass roots level, and take part in a larger community engagement process where the input is more informed, more viable, and is received actively from a larger segment of the public over the duration of the FEIS process.

There are a myriad of residents, property owners, business interests, agencies and groups that have an interest in the West/East Transportation Corridor Study. As a result, the study team has identified organized groups and other interests potentially affected by the location of the LRT system within the corridor. These individuals will be brought together by their common interests into groups which will serve effectively as forums for discussion and dialogue. Five working groups will be established for the West/East Corridor. They will work independently on issues specific to their interests and needs (see Figure 2). Project planners will keep each group informed of the other working groups' efforts. The five working groups are:

- Airport and International Center
- North Temple Street
- Downtown (which includes the Gateway and CBD)
- 400 South
- University and Research Park

For the geographic location of the FEIS Working Groups see Figure 4. The overall objectives of the working groups will be: (1) to identify planning, urban design and other issues specific to their group's concerns; (2) to discuss opportunities and ways to resolve those issues; and (3) to act as advisors to the study team, so project planners can develop creative solutions to planning and design issues. Each working group will meet regularly throughout the FEIS process (twice a month) or until all issues the group identifies are resolved. Each group will be led by an appointed chairperson. The study team will assist in the facilitation and documentation of each working group meeting.

Traditional modes of public involvement have somewhat of a two-party or a "we said, they said" mentality. For the FEIS public involvement program, the focus will be on true communication. Communication should be both participative and reflective; and the two aspects need to be integrated to produce true openness and real listening among participants and stakeholders about the issues. The goal of the working groups will be to achieve dialogue. Dialogue evokes the capacity to suspend assumptions and enter into thinking together. Dialogue differs from discussions; however, in stakeholder involvement, discussions are the necessary counterpart of dialogue. Dialogue can accelerate the understanding of complex issues. The integration of dialogue and discussions should ultimately lead the study team to creative solutions to important project issues.

The efforts of the working groups will be directed toward ensuring that all issues are considered and recommendations as to issue resolution are given. Any decisions made regarding issue resolution will be led by the Steering Committee and will be consistent with Salt Lake City planning efforts as well as the overall goals of the West/East Transportation Corridor Study. Members of the study team will meet regularly with Salt Lake City planners, city officials and civic leaders to discuss the project's status and give presentations on the study results.

**D. Open House/FEIS Public Meeting**

Another important component of the FEIS public involvement plan is the FEIS Open House and Public Meeting. This public meeting will be scheduled for late summer 1998. The purpose of the open house and public meeting will be to present project study information, informally discuss project issues, working group activities, the proposed LRT alignment (including proposed station locations and route), and to receive public comments on important project aspects. For the open house, numerous maps, exhibits, aerial photography and other project information will be on display. Representatives from the Steering Committee and the study team will be available to answer questions and receive comments. Project planners will provide follow-up correspondence and coordination meetings as needed to address public comments and concerns. Meeting notices will be widely distributed and the meeting will be covered by the news media.

The open house portion of the public meeting will be held during a convenient four-to-eight hour period that would provide residents time to view the exhibits, view project information, and ask questions. Greeters will be at the door to register participants, distribute handouts and orient the public to the exhibit areas as necessary. Participants will be able to come and go as they wish. Tables and chairs will be provided for people to read project information, complete comment sheets, or talk with other citizens. Both visual and printed materials will present complex technical ideas clearly and simply so the public can understand and respond to them. Only a brief formal presentation by the study team is anticipate for the public meeting. This introductory presentation will focus on a project update, status of technical studies and working group activities, and results of evolving project decisions. The focus of the public meeting will be to solicit, record and document public comments on the proposed LRT system.

### E. Agency Coordination and Follow-Through Actions

Close coordination with the resource and regulatory agencies will occur throughout the FEIS process. Issues, concerns and potential environmental impacts that were identified during the MIS/DEIS process as well as those raised during agency coordination meetings will be addressed during the FEIS study. All agencies will be kept well-informed as to the project's status, schedule and results of the environmental analysis. In some cases, such as the U.S. Corps of Engineers, permitting requirements and timelines will be discussed and integrated into the overall project schedule. The list of agencies includes, but is not limited to:

- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife
- U.S. EPA, Utah Region Office
- U.S. Department of Agriculture (Natural Resources Conservation Service)
- Utah Department of Environmental Quality
- Utah Department of Natural Resources
- Utah State Historic Preservation Officer
- Utah Division of Air Quality
- Utah Department of Transportation

Summaries of individual agency meetings will be documented. Extensive agency follow-through will occur, such as sending them regular project mailings or newsletters and handling agency questions and information requests as quickly as possible.

## IV. Resolution of FEIS Issues

To effectively address identified FEIS issues, a proactive resolution approach will be necessary. More open and frequent discussions will need to occur between the study team, Steering Committee, residents, public and private interests and other stakeholders. A mutual understanding of the issues will be the focus rather than the one-way education of one set of viewpoints over another. The five working groups will play an important role in the issues resolution process.

## A. Issues Perspectives and Resolution Approach

The FEIS issue resolution process will first identify all stakeholders involved and their respective roles; then invite them to participate on one of the five working groups (see Figure 5). It will determine through regular meetings their concerns and needs and identify credible information conduits within each major stakeholder group. Timely project information will be released as appropriate to each working group to heighten the level of communication and the issues resolution process.

The dialogue achieved through the working group process will represent a new way of paying attention to project issues and their resolution for the FEIS study. This approach allows participants to become more aware of different perspectives, to know the rules for acceptable and unacceptable conversation, and to more fully understand the methods for managing viewpoint differences. The specific items which will go through this process will be the following:

- Memorandum of Agency Comments/Issues
- Memorandum of Understanding for Affected Agencies
- Documentation of Station and Parking Requirements
- Technical Memorandum on 400 South Traffic
- Mitigation Plan for Traffic Impacts
- Memorandum Documenting Alignment and Extensions
- Conceptual Design Plans for the LPA
- Conceptual Design Plans for the Stations
- Revised Cost Estimates
- Technical Memorandum on Utility Issues

The issues resolution approach offers a means by which persons and groups, who have different viewpoints and experience, can identify, describe and communicate their perspective with one another; thereby displaying the meaning of the information they consider relevant to a particular issue.

The input received from the working group process will provide valuable information to the study team to develop creative project solutions and resolve outstanding issues. These planning and design solutions along with the resolution of any other issues will be discussed within the regular monthly meetings of the Steering Committee (see Figure 5). Once the Steering Committee approves of the study team's recommended solutions and project actions, those decisions will be communicated to city leaders and public officials so they are kept well informed of the West/East Corridor FEIS Study. The Steering Committee will also interface as appropriate with the Federal Transit Administration to ensure them that all issues are being addressed. Joint meetings between Working Group representatives and the Steering Committee will also occur as appropriate.

## B. Issues Resolution Matrix and Mitigation Strategies

Early in the FEIS study, an issues resolution matrix will be developed to highlight and track all identified project issues. The matrix will note the issue, the person or agency responsible for resolving the issue, the timeline for resolution, and the eventual outcome or result of the issue's resolution. In some cases, there may be mitigation strategies associated with the project issue resolution. For example, for the issue of wetland impacts, a mitigation strategy may be to enhance or add to an existing wetland mitigation site. For an issue associated with an LRT station location, the mitigation strategy may involve a change in station location or design. At the end of the FEIS study, the issues resolution matrix would be completed. In addition, all mitigation strategies and measures will be listed in a formal FEIS Mitigation Document so all parties and regulatory agencies will have a full understanding of the commitments being made. Any engineering or urban design amenities or refinements would also be documented and noted in the Mitigation Document.

# West/East Transportation Corridor
# MIS/DEIS Information Exchange Process

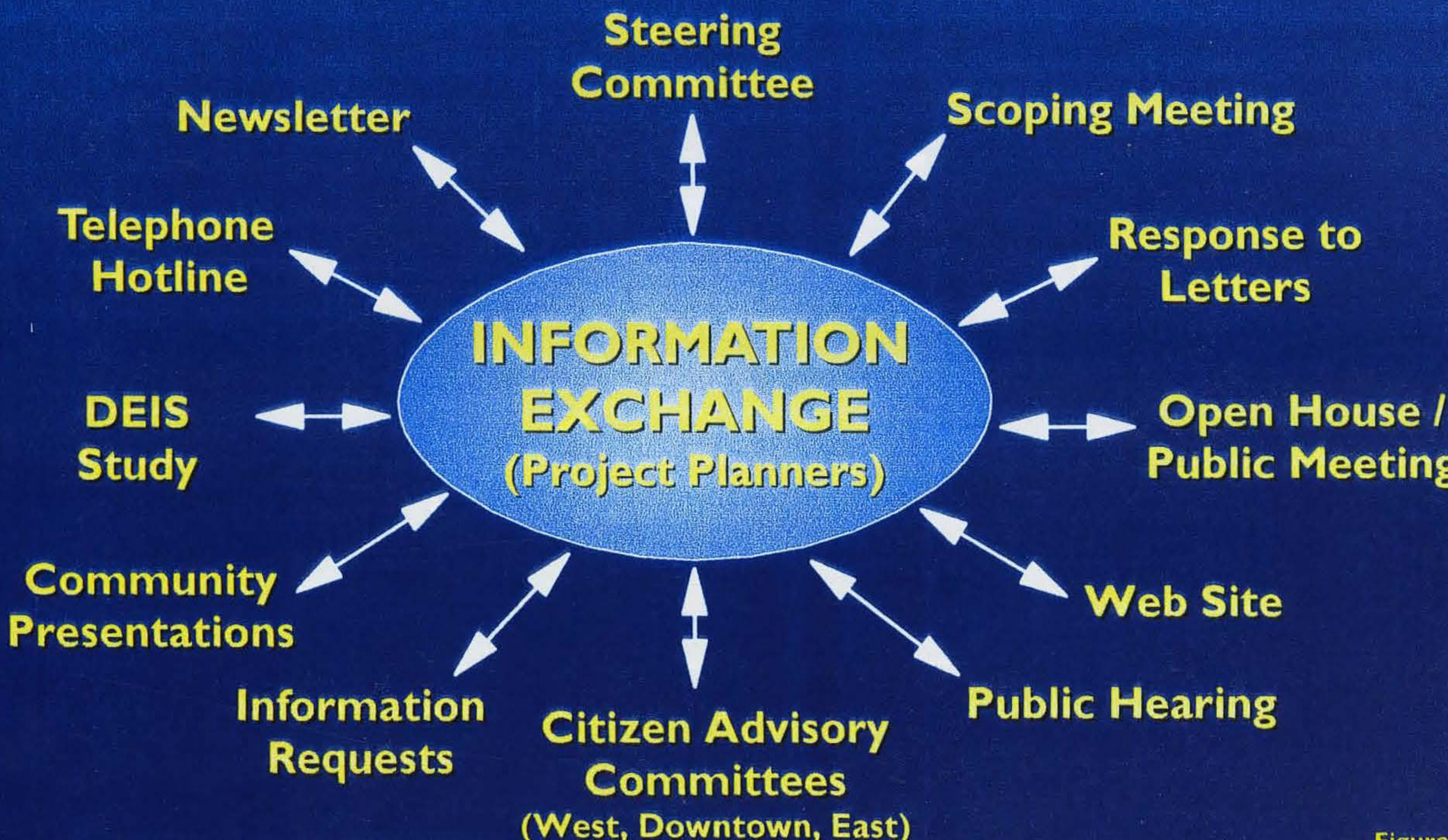
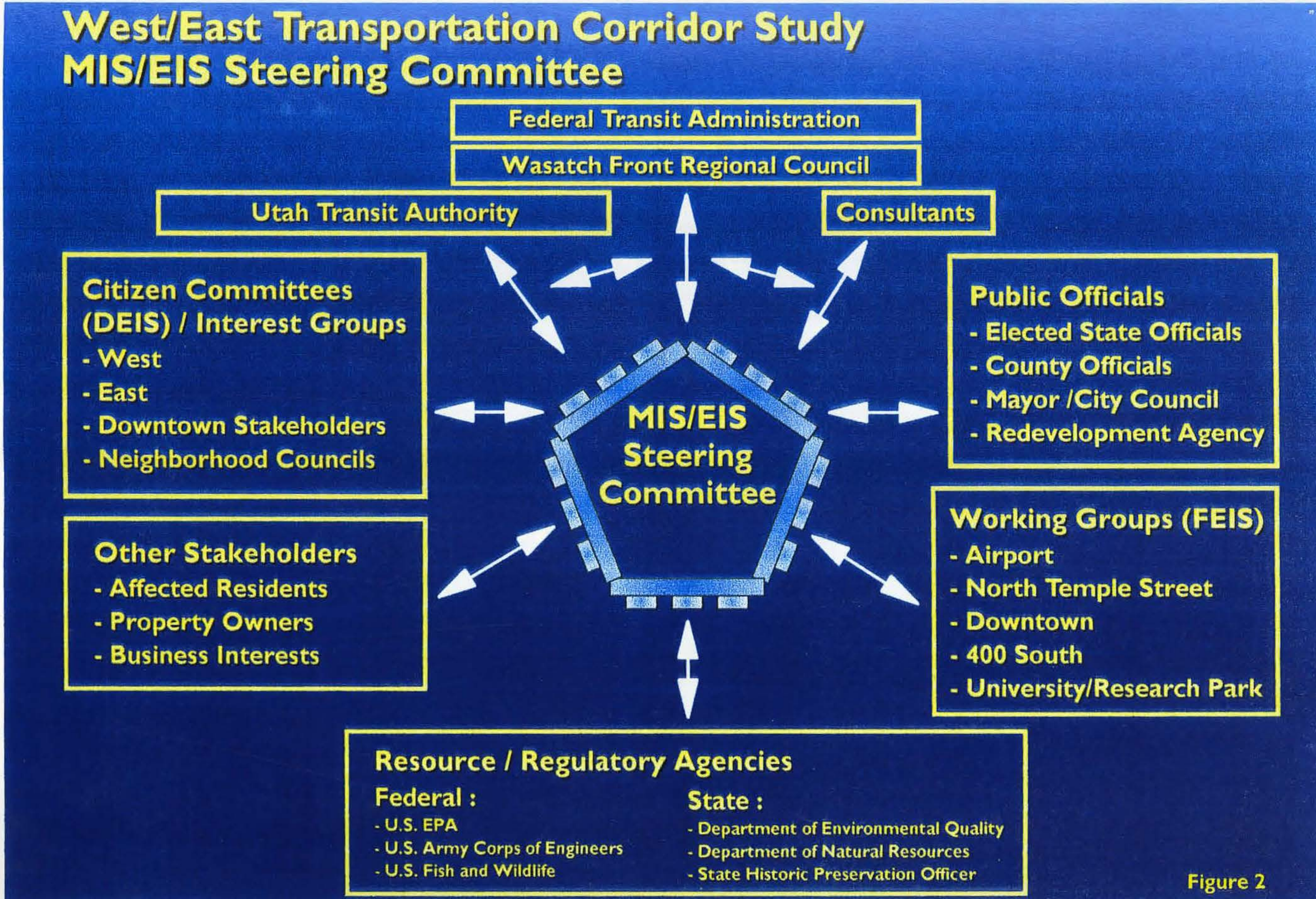
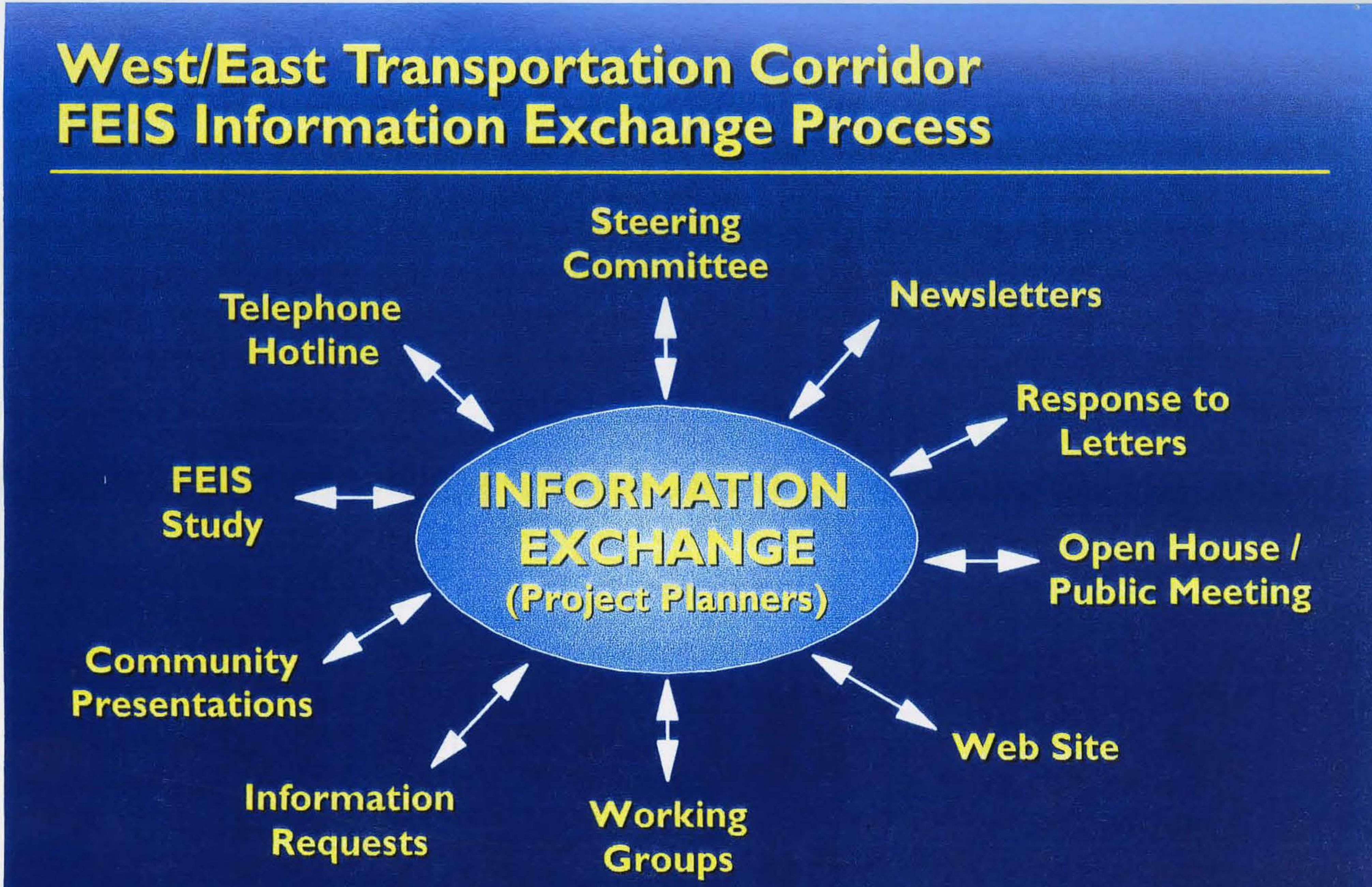



Figure 1


West/East Transportation Corridor Study
MIS/EIS Steering Committee
Federal Transit Administration
Wasatch Front Regional Council
Utah Transit Authority
Consultants
Citizen Committees (DEIS) / Interest Groups
- West
- East
- Downtown Stakeholders
- Neighborhood Councils
Other Stakeholders
- Affected Residents
- Property Owners
- Business Interests
MIS/EIS Steering Committee
Public Officials
- Elected State Officials
- County Officials
- Mayor /City Council
- Redevelopment Agency
Working Groups (FEIS)
- Airport
- North Temple Street
- Downtown
- 400 South
- University/Research Park
Resource / Regulatory Agencies
Federal :
- U.S. EPA
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife
State :
- Department of Environmental Quality
- Department of Natural Resources
- State Historic Preservation Officer
Figure 2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FEIS Study
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(Project Planners)
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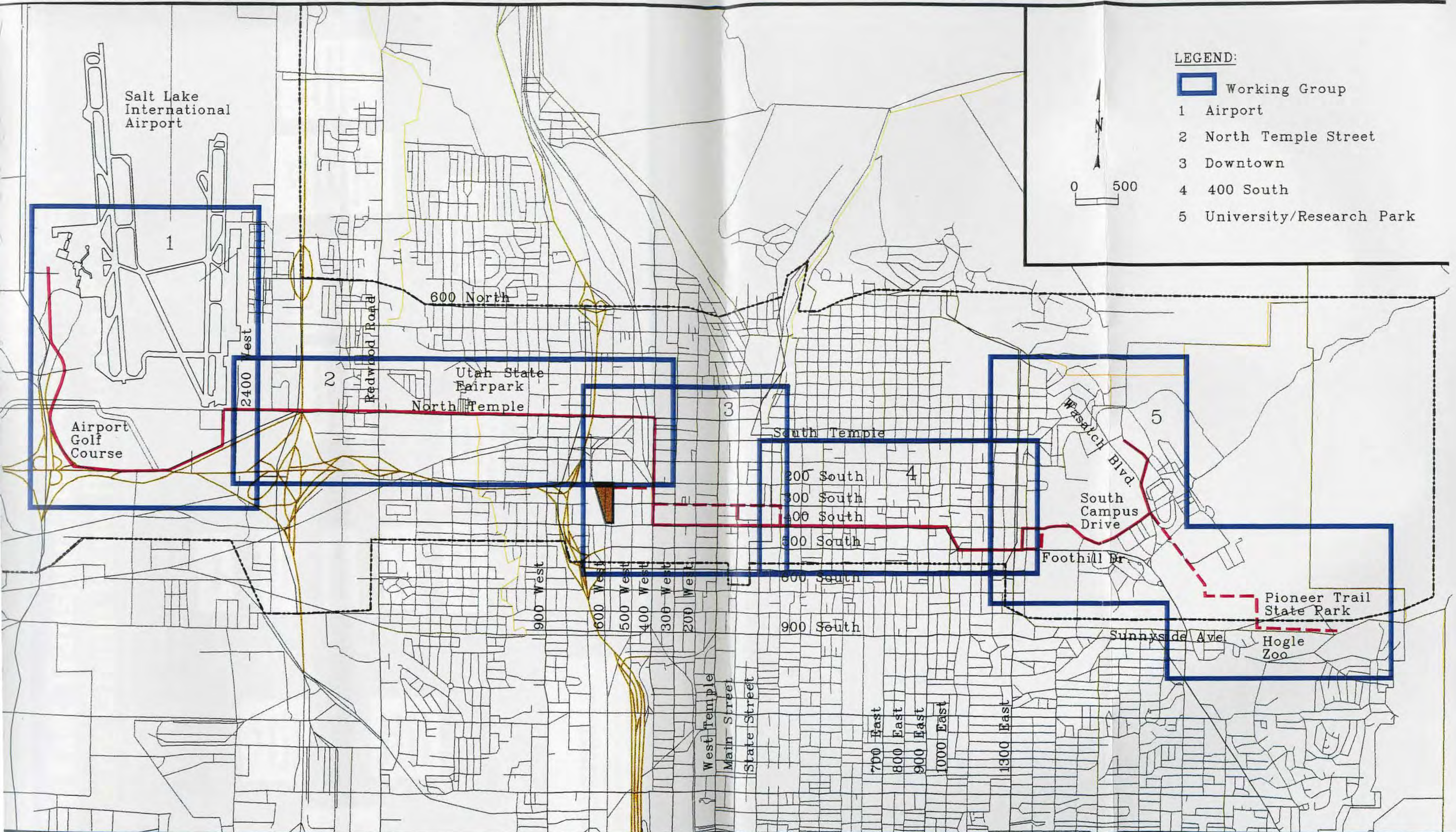
Community Presentations
Web Site
Information Requests
Working Groups

Figure 3




TRANSPORTATION UNIVERSITY-DOWNTOWN-AIRPORT MAJOR INVESTMENT STUDY

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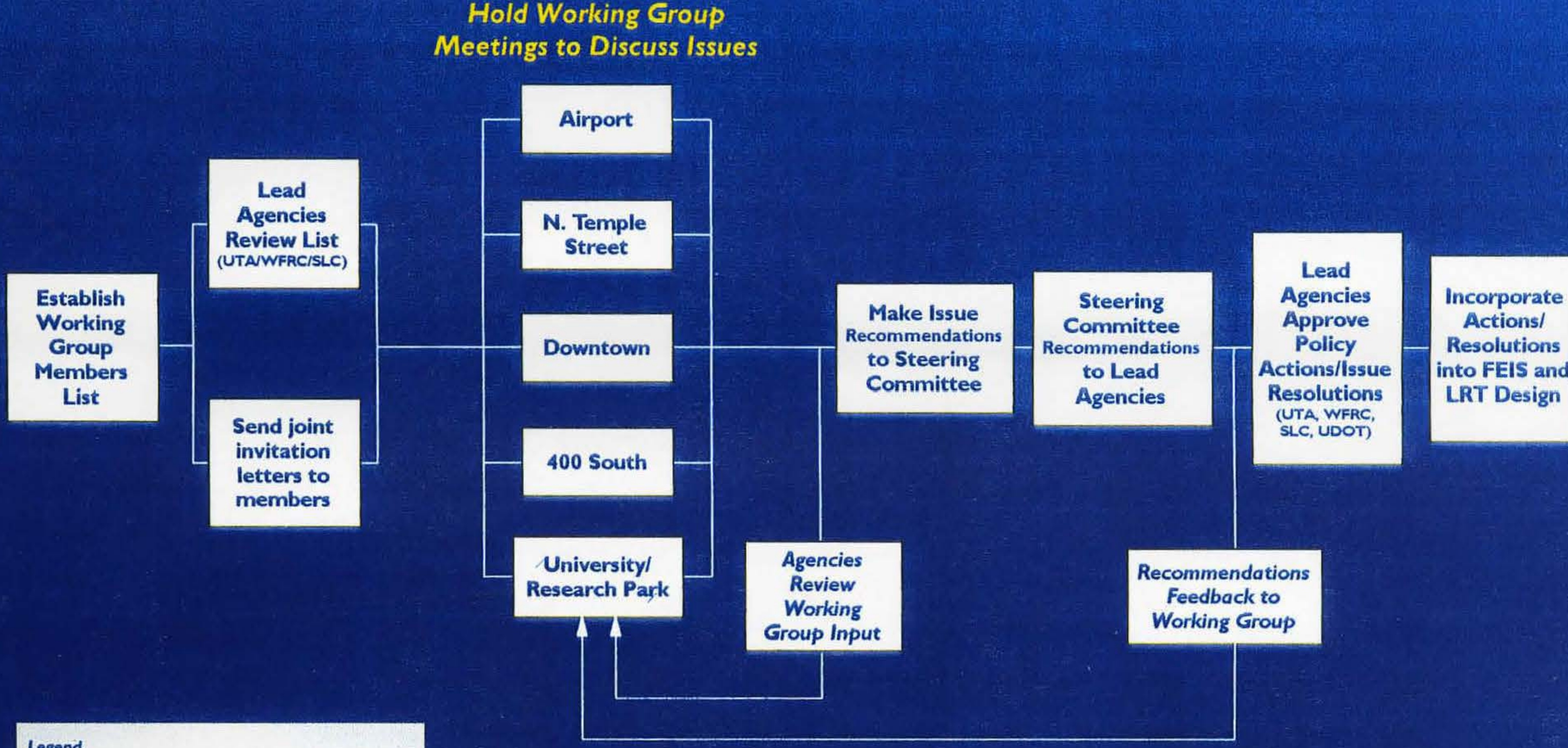
West/East Transportation Corridor
FEIS WORKING GROUPS

Figure 4

ISCADD/CADD/DELEUW/LRT/DGN/WEWRKGRP.DGN R01 02.02.98

# West/East Transportation Corridor FEIS Working Group Issue Resolution Process




*Legend.*

| | |
|---|---|
| UTA | Utah Transit Authority |
| WFRC | Wasatch Front Regional Council |
| SLC | Salt Lake City |
| UDOT | Utah Department of Transportation |

Figure 5